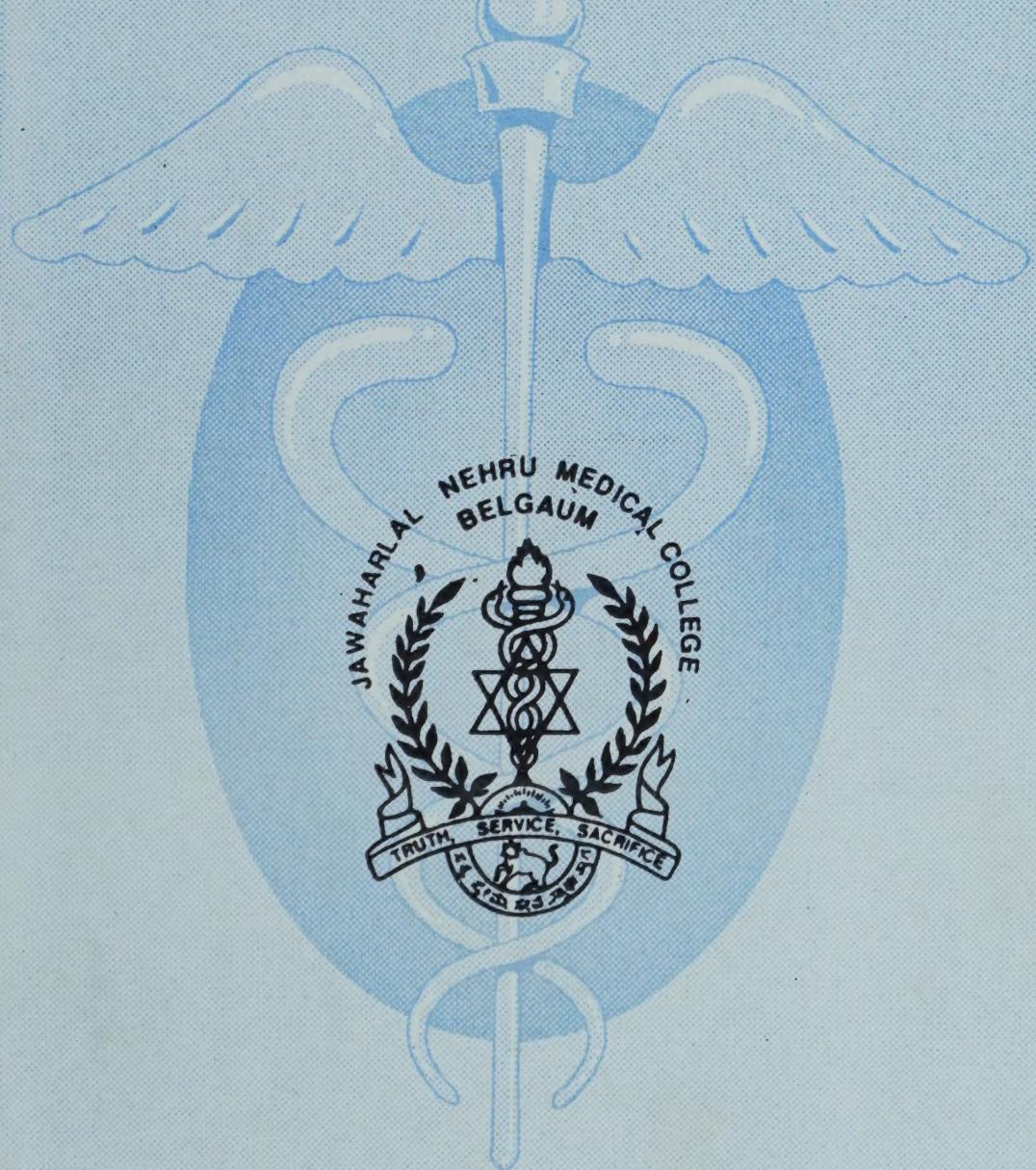


# MEDICAL EDUCATION TECHNOLOGY



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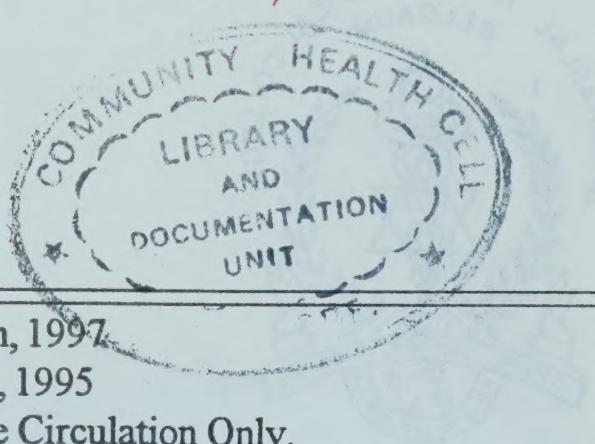
# MEDICAL EDUCATION TECHNOLOGY



K. L. E. Society's  
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1005  
9/9/97

MP-130  
04784 N97



2nd Edition, 1997

1st Edition, 1995

For Private Circulation Only.

**Published by :**

Dept. of Medical Education

K.L.E. Society's

Jawaharlal Nehru Medical College,  
Belgaum - 590 010

Phone: 451350. Fax: 451759

**Printed by:**

Sharp Business Systems

Belgaum - 590 002

Phone: 431026

## P R E F A C E

I have great pleasure in presenting the second edition of this manual being published by the Dept. of Medical Education, J.N. Medical College, Belgaum. Basically designed to serve as a resource material for the participants of the III National Workshop on 'Medical Education Technology', this compilation reflects the areas that need to be addressed to by the medical educators.

Over the years, concern has been voiced over the deteriorating quality of Medical Education at different fora. Training the teachers as effective communicators has been advocated as one of the remedial measures. The Medical Council of India, too has been expressing the need for equipping the teachers, especially the entrants to the profession, with adequate information about the educational process in order to enable the teachers to perform their role in a more meaningful manner. In this regard, the Dept. of Medical Education, J.N. Medical College, Belgaum has initiated a dialogue with faculty members of various disciplines through in-house workshops. The National Workshops represent an extension of that exercise on a wider canvas for exchange of ideas with the practitioners of Medical Education in the neighbouring institutions.

A number of innovations have been brought into the field of teaching and evaluation. Our experiences with these innovative adaptations have also been presented. We urge you to incorporate them in your curriculum and share your results with us.

I am indebted to the various resource persons for contributing the articles. I am sure that you will find them useful. I solicit your views and suggestions for further improvement of this manual.

March 12, 1997

**Dr. H.B. Rajashekhar**

*Chairman*

Dept. of Medical Education

J.N. Medical College, Belgaum.



K. L. E. Society's

## Jawaharlal Nehru Medical College, BELGAUM.

Department of Medical Education

Over the years vast developments in health sciences and changes in social structure of the country have necessitated a rethinking on the modality and validity of medical education. Newer diagnostic techniques, medical skills and education technology have to be used in order to train a medical graduate to render optimum health care to the individuals and to the community. Hence, the teacher in a medical college needs training in medical education technology. This necessity gave birth to a "Cell" in 1989 and was called as J. N. Medical College, Medical Education Cell, which consisted of a few dedicated medical teachers. It started functioning by conducting orientation programmes for the new entrants to the medical college and later on teachers training programmes. In 1993 the cell became a full-fledged department of Medical Education with the following faculty :

Chairman	:	Prin. Dr. H. B. Rajashekhar.
Directors	:	Dr. B. S. Kodkany.
	:	Dr. C. S. Patil.
Secretary	:	Dr. S. S. Goudar.
Members	:	Dr. S. V. Jatti.
	:	Dr. (Mrs.) Vijaya A. Naik.
	:	Dr. M. N. Sankpal.
	:	Dr. A. S. Desai.
	:	Dr. M. B. Bellad.

Dr. (Mrs.) M. Sachdeva, Secretary, Medical Council of India, New Delhi, formally inaugurated the newly designed and completely equipped complex, consisting of the sections of Medical Illustration, Instrumentation and documentation, on the 7th January, 1994. She wished the Department of Medical Education success in all its endeavors.

**AIMS :**

1. Plan the curriculum based on national health needs.
2. Life long learning.
3. Competency based learning.
4. Integration of science with clinical practice.
5. Teachers trained as educators.
6. Co-ordination of medical education with health care services.
7. Multiprofessional training.
8. Selection and training of entrants for non-cognitive as well as intellectual attributes.
9. Innovations in medical teaching and evaluation.
10. Continuing medical education.
11. Training in research methodology.

**Functions :**

1. Curriculum design.
2. Innovations in teaching - learning and evaluation.
3. Training of trainers
4. Orientation Programmes-undergraduate and postgraduate.
5. Student - Teacher Interaction - Preceptor.
6. Media production centre.
7. Behavioral science workshops.
8. Data centre and documentation service.
9. Research activity - guidance.
10. Research and evaluation centre.

**General Activities :**

1. Restructuring the clinical posting for MBBS Phase - III students i.e. for 5 weeks each of E. N. T., Ophthalmology and Community Medicine and 10 weeks each of Medicine, Surgery, Obst. & Gynaec and 5 weeks each for Paediatrics and Orthopaedics.

2. Appointed 'Preceptors' for MBBS Phase-I students admitted in July/August, 1992 to monitor and promote the well-being of the students in regard to their studies, health and various other aspects.
3. Dept. of Physiology conducted the objective Structured Practical (OSPE) for MBBS Phase-I/II term students on 28-30 April, 1994. OSPE is being conducted regularly by the Department since then.
4. Goals and objectives were framed by various departments for undergraduates as per the request of All India Institute of Medical Sciences, New Delhi.
5. Integrated teaching programme for undergraduate and postgraduate students.
6. Celebration of Teachers Day on 5th September, every year

**Publications :**

1. 'National health policy - 1998 and National Health Programmes' - which was contributed by MBBS Phase III students on Teachers day 1991.
2. Compiled a document on 'National Health Policy - 1980- 2nd edition and 'National Health Programmes' (2nd edition) June 1994.
3. 'National Health Policy - 1983 and National Health Programmes' - (3rd edition.) Feb. 1995.
4. Souvenir - 'VII Karnataka State Obstetrics & Gynecological Association Conference', 1993.
5. Souvenir - MCI South Zone Workshop on 'Training Teachers Today for Tomorrow's Needs', January 1994.
6. Souvenir - National Conference on Medical Education, "Training Teachers Today for Tomorrow's Needs", Sept. 1994, on the occasion of Diamond Jubilee of MCI.
7. Document for workshop on 'Behavioural Sciences and Health Management', 18-20 Aug. 1994.
8. Background document - National Conference on Medical Education MCI Diamond Jubilee Celebrations - September, 1994.

## Medical Education Technology

9. Souvenir - 42nd National Conference of Anatomical Society of India, December 1994.
10. Souvenir - 4th Annual Conference of Karnataka Medico-legal Society, January 1995.
11. Souvenir - Fourteenth Annual Conference of Indian Society of Health Administrators, Bangalore, February 1995.
12. Souvenir - 41st National Conference of Association of Physiologists & Pharmacologists of India, December 1995.
13. Document on Learning Objectives and Community Survey Data Analysis released during the Medical Officers Training Programme on Integrated Delivery of Reproductive Health Care Services - June 1996.
14. Document on Common Syllabus, Curriculum and Evaluation Methodology in Preclinical subjects - August 1996.
15. Proceedings of the ICMR - CONRAD Workshop on "Epidemiologic Approach to Research - November, 1996.

Particulars	Conducted on		
<i>Orientation Programs :</i>			
1. Undergraduates	5-7	Aug.	1991.
	6-9	Aug.	1992.
	3-4	Dec.	1993
	18-19.	Nov.	1994
	27-29	Jan.	1996
	10-11	Jan.	1997
2. Postgraduates	27-28th	Mar.	1992.
	11-12	Mar.	1994
	28-29	Nov.	1994
	27-31	Oct.	1995
	11-13	Feb.	1997
	17-19	Feb.	1997
	24-26	Feb	1997
3. MBBS Phase-II/I term students in February, 1994.			

**Workshops :**

5. Teachers Training on 'Medical Education Technology' conducted in collaboration with the Dept. of Medical Education, KMC, Manipal.	9-11	Jan.	1992.
6. - do -.	26-28	Jan.	1993.
7. Workshop on 'Tympanoplasty' conducted by Department of E. N. T.		Aug.	1993
8. MCI South Zonal Workshop-1994 on "Training Teachers Today for Tomorrow's Needs".	7-9	Jan.	1994
9. Workshop on "Minimal Invasive Surgery in Obst. & Gynaec." Conducted by Dept. of OBGYN.	19-20	Mar.	1994
10. Teaching Learning and Evaluation Workshop	24-25	Apr.	1994
11. Workshop - "Improving Health education/Counselling /Technical Skills in delivery of contraceptives through Cafeteria Approach", conducted by ICMR, Dept. of OBGYN.	24-26	Apr.	1994
12. IOL Implantation Workshop conducted by Dept. of Ophthalmology.	16-17	Apr.	1994
13. "Behavioural Sciences and Health Management", conducted in collaboration with Indian society of Health Administrators, (ISHA) Bangalore.	18-20	Aug.	1994

Medical Education Technology

14. "Corporate Planning & Organisational Development of K. L. E. Society's Health Science Institutions", conducted in collaboration with ISHA, Bangalore.	18-20	Aug.	1994
15. "Faculty Development and Academic Excellence". in collaboration with ISHA, Bangalore.	22-24	Sept.	1994.
16. Teaching -Learning and Evaluation Workshop.	29	Sept. to 1st Oct.	1994
17. National Workshop on "Innovations in Health Science - Teaching & Research", conducted in collaboration with ISHA, Bangalore.	16-17	Feb.	1995
18. Postgraduate Symposium on "AIDS"	20th	Mar.	1995
19. Mini Workshop on "Personality Development and Self Appraisal".	21st	Mar.	1995
20. Mini Workshop on "Use of Computers in Medicine".	25th	Mar.	1995
21. Mini Workshop on "Disinfection and Sterilisation in Hospitals".,	29th	Mar.	1995
22. Innovations in Teaching, Learning and Evaluation in Basic Sciences, organised by APPI, Belgaum Branch.	29th	Apr.	1995
23. I National Workshop on Medical Education Technology.		Sept.	1995

Medical Education Technology

24. Workshop on "Syllabus, Curriculum And Evaluation in Medicine, Surgery And Obstetrics & Gynaecology.	29-30	June,	1996
25. Workshop on "Syllabus, Curriculum and Evaluation In Anatomy, Physiology And Biochemistry.	10-11	Aug.	1996
26. Workshop on "Training of Trainers"	15-17	Feb.	1996
27. Workshop on "Postgraduate Medical Education"	23rd	Feb.	1996
28. II National Workshop on "Medical Education Technology".	21-24	Mar.	1996
29. Workshop on Modified District Project	9-10	Apr.	1996
30. CME and Workshop on Curriculum Planning & Evaluation (In Orthopaedics)	10-11	Apr.	1996
31. Workshop/Training Programme for Medical Officers of PHCs of Belgaum District on "Reproductive Child Health Care".	17-22	June.	1996
32. - do -	19-24	Aug.	1996
33. - do -	9-14	Sept.	1996
34. - do -	17-22	Sept.	1996
35. Workshop on "Hospital Infection and Prevention".	14-19	Oct.	1996

## Medical Education Technology

36. ICMR - CONRAD Workshop on 18-29 Nov. 1996  
"Epidemiological Approach to Research in RCH".

## CONFERENCES :

37. "VII Karnataka State Obst. & Gynaecological Association Conference", conducted by Dept. of OBGYN. 11-12 Sep. 1993

38. 42nd National Conference of Anatomical Society of India. 27-29 Dec. 1994

39. 4th National Conference of Karnataka Medico-Legal Society. 21-22 Jan. 1995.

40. Fourteenth Annual Conference of Indian Society of Health Administrators - "Health for All by 2000 A. D. - An Evaluation of Targets and Achievements". 13-15 Feb. 1995

41. Karnataka State Level Meet of Indian Association of Medical Microbiologists, Karnataka Chapter. 23rd Sept. 1995

42. 14th National Conference of Indian Society of Anesthesiologists, Karnataka Chapter. 13-15 Oct. 1995

43. 41st National Conference of Association of Physiologists & Pharmacologists of India. 26-28 Dec. 1995

## CME Programmes :

44. XI CME and P. G. Course in Pathology on Muscle Disorders. 9-12 June 1993

45. CME in Obstetrics & Gynaecology 10th Sept. 1993

46. CME in Orthopaedics 9th Apr. 1994

Medical Education Technology

47. Short Course on CME, Conducted by JNMC Scientific Society.	9-10	Apr.	1994
48. XII CME and P. G. Course in Pathology	8-11	June.	1994
49. CME on Postgraduate Medical Education	26th	Dec.	1994
50. CME for General Practitioners, Conducted by JNMC Scientific Society.	9th	April,	1995
51. CME Programme in Medicine.	2nd	June.	1995
52. CME Programme on Physiology & Pharmacology held, under the auspices of Medical Council of India, New Delhi and Medical Education & Research Trust, Bangalore.	25th	Dec.	1995
53. CME Programme in Pathology		June.	1996

**Annexure - 1**

**List of Equipments Available and Staff Position**

**I) EQUIPMENTS :**

S.No.	Particulars	Quantity
1)	Slide Projector- Carry Scope 100 - A, 35 mm.	2 Nos.
2)	Slide Projector -Mini Scope.	4 Nos.
3)	Slide Projector - Kindermann Auto Focus with Trays.	2 Nos.
4)	Zoom lens for kindermann Projector.	2 Nos.
5)	Overhead Projector - Folding Type with Halogen Lamp.	1 No.

## Medical Education Technology

6)	HCL Computer with MS Office, , MS Powerpoint, Microsoft Word, MS Excel, Windows, Wordstar With Dot Matrix Printer and Colour Desk Jet Printer.	1 No.
7)	Canon Xerox Machine with Stabilizer and Standard Accessories.	1 No.
8)	Colour T. V. Set - Videocon 25".	2 Nos.
9)	V. C. R. - Videocon (500E).	1 Nos.
10)	Video Camera, Panasonic M3000	1 No.
11)	Amplifier (Phillips)	1 No.
12)	Radio Stereo (Phillips)	1 No.
13)	Collar Microphone	3 Nos.
14)	Steel Cupboard.	3 Nos.
15)	Electronic Typewriter.	1 No.
16)	Blackboard.	1 No.

## Technical Staff

Steno	- Mr. Shankar S. Kalli.
Computer Operator	- Mr. Basavaraj R. Killedar.
Artist-Cum Photographer.	- Mr. G. B. Patil
Artist-Cum-Photographer.	- Mr. C. B. Gudodgi.
Modellor-Cum- Videographer	- Mr. V. V. Guggari.
Projectionist	- Mr. A. G. Naik.
Dark-Room Asst.	- Mr. M. S. Karadi.

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# Medical Education Technology

# PLANNING IN MEDICAL EDUCATION

Dr. B.S. Kodkany  
Director,  
Dept. of Medical Education  
J.N. Medical College, Belgaum.

*"We have the best course in Anatomy of any Medical school in the country. What they don't cover in the lectures and the laboratory, they do cover in the university examination".*

- A student

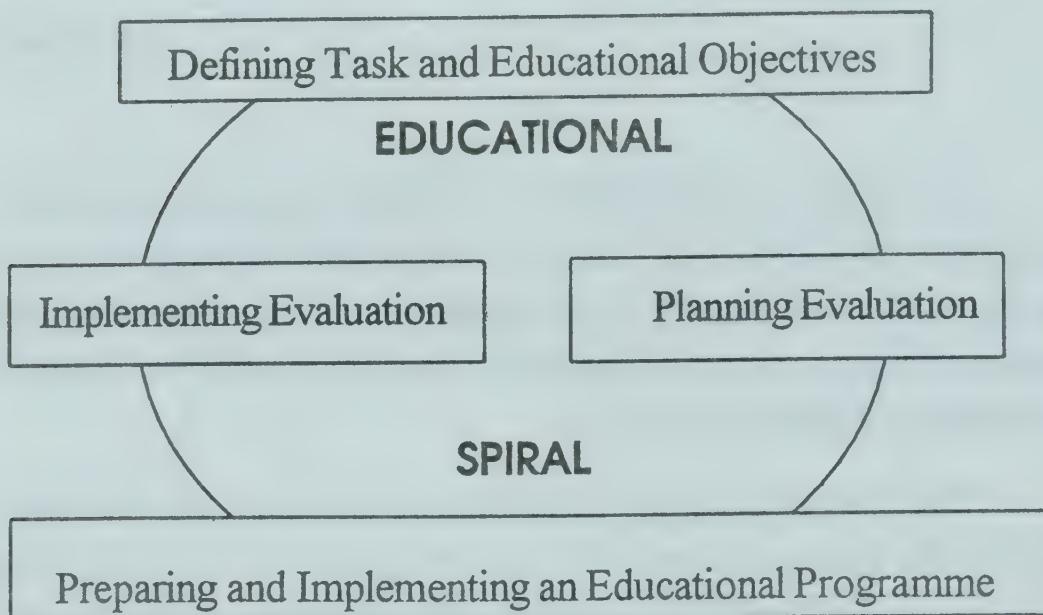
Those words coming from the student community succinctly express the overall situation in most of the medical colleges in general and other disciplines as well. There is therefore a growing concern to improve efficiency, effectiveness and more importantly the relevance of education of health personnel.

The ultimate purpose of educational objectives is to contribute towards the maintenance and improvement of the health of the population by facilitating training of health personnel and ensuring the relevance of the course to the health needs of the community. The medical colleges have the responsibility of;

- 1) Giving direction to the educational programme.
- 2) Facilitating educational planning.
- 3) Improving the evaluation of the programme.

It is necessary that the medical colleges must frame the objectives for which the institute has been established, and these educational objectives must be based on the health needs of the community and the desired change in the behaviour of the learner.

In most of the institutions, planning of medical education has been unfortunately equated to framing the time-table, covering the syllabus and conducting the examination. A sequence which may be largely responsible for the words mentioned by the students at the beginning of this text. It is obvious that medical education must be based on scientific planning which should include instructional objectives and evaluation methods based on the skills expected to be acquired by the student. A broad outline of this plan is depicted in the diagram. (Fig1).



**Fig. 1 : The Educational Spiral**

The fundamental concept that emerges is that the educational objectives have to be specified at three levels.

- 1) Primary - Institutional objectives
- 2) Intermediate - Departmental objectives
- 3) Tertiary - Specific instructional objectives

However, it is to be kept in mind that these objectives must be learner oriented and not teacher oriented. It would be pertinent to

recollect that, one can learn without being taught, but one cannot teach without learning.

Defining the objectives alone, without specifying the expected level of performance of the learner for certifying his/her competence at the end of the course will not achieve the desired behavioural change.

For, as G.E. MILLER said,

**To change curricula or instructional methods without changing examinations would achieve nothing!**

**Changing the examination system without changing the curriculum had a much more profound impact upon the nature of learning, than changing the curriculum without altering the examination systems".**

Planning of an educational programme is not the responsibility of the head of the institution/department alone, but rather should involve a continuous interaction between the learner, the teacher and the community ascertained from hospital, and health care delivery system. The teacher should act as the interface to satisfy the health needs of the community as well as the aspirations of the student.

Another major issue which needs to be addressed is the enormous explosion of scientific knowledge. Medical Education, which started with only four disciplines has now got compartmentalised into over thirty specialities. The duration of the course, however has remained more or less the same, thereby imposing a heavy burden on the learner.

Planning of the educational programme must be on a continuous basis involving every faculty member. It is mandatory for every department to conduct regular meetings for the planning of the curriculum. Lesson planning should be based on specifying the learning objective, the course content and the methodology of instruction.

## Medical Education Technology

Defining the educational objectives would go a long way in individualising the learning and enable the teacher to play the role of an inducer and facilitator.

## REFERENCES :

- 1) Clark D.C., Using instructional objectives in teaching, Glenview, IL, Scott and Foreman 1972.
- 2) Guilbert J.J. Educational handbook for Health Personnel, WHO document, 1981.
- 3) Miller G.E. et al ed.; Teaching and Learning in Medical School, Cambridge MA, Harvard University Press 1961.

# COMMUNICATION SKILLS

Dr. A.G. Chandorkar  
Prof. of Pharmacology,  
DYPES Medical College,  
Kolhapur.

## INTRODUCTION :

All people communicate. They do not have to say anything necessarily to convey their meaning, a lifting of the finger or eyebrows can "convey or say" a lot. As well all know communicating is a fundamental activity in our lives. So it must be equally basic to our training. Dictionary definitions say that to communicate is to share, transmit, impart information or ideas. Training is also the same, but in training you have to communicate successfully, and secondly in training it has to be an exchange, because it can not be only in one way, i.e. from one person to another, but between them. When you are trying to communicate, you are trying to influence somebody, in training you are trying to influence the trainee or your students, so that they show a change of behaviour, generally by performing the jobs or things they could not do earlier or by performing better at their jobs.

### The aims of communication are :

The sharing and interchange of information such as knowledge, mental skills, motor skills, and attitudes.

Achieve success in this sharing and interchange by having the communication :

- Received (heard or seen)
- Understood
- Accepted (nothing is going to change unless the communication is accepted)

- Get some action (as seen by change in performance or behaviour). If we fail to meet any of these aims of communication, it means the process of communication has failed and suggests that the training has failed too.

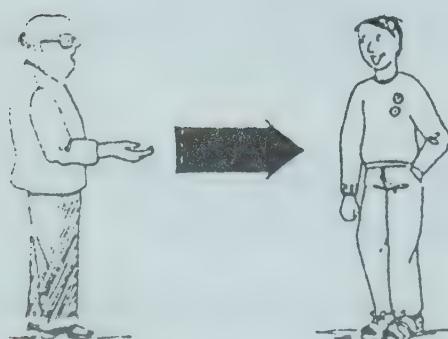
### Model of communication :

Models represent a simplified version of the real thing, a reality, on a smaller scale. Models help us to understand how the reality works as they concentrate on the elements of real life, showing their inter relationships, or working parts. There are four main models which we will look at. These are :

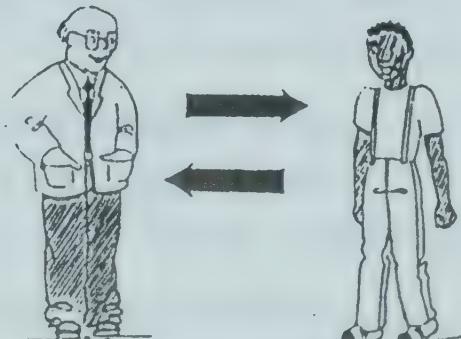
- One way, two way models
- Shannon and Weaver model
- SMCR model (Berio)
- Westley - Maclean model

All communications involve two people: one is a source who gives information - senders and the one at whom the giving is directed the receiver (R).

ONE-WAY COMMUNICATION



TWO-WAY COMMUNICATION  
BETWEEN PEOPLE



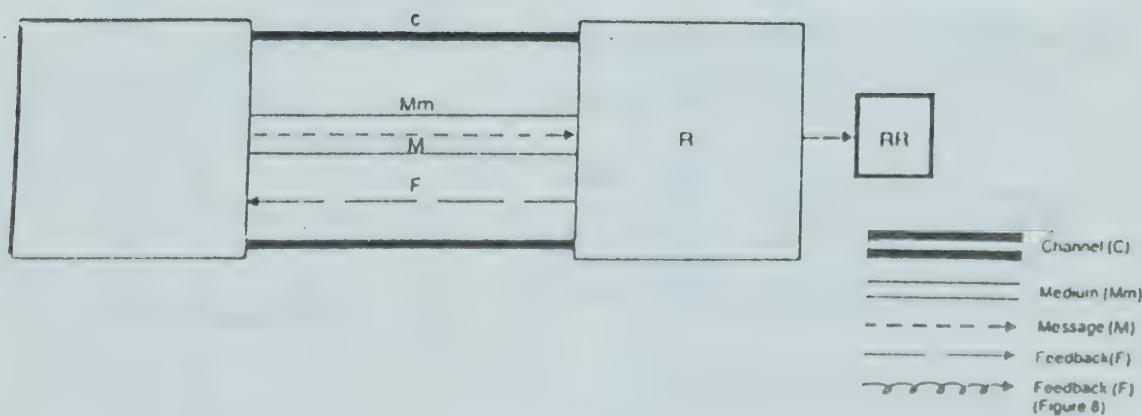
The information is to be put into some special form, a language, a sound picture, a visual impression, symbols or signs and gestures. This is the code, and the person or sender is "Encoder". Similarly the receiver has to translate the word, image, or sound code to make sense out of it this procedure is decoding and he is called "Decoder".

Thus senders are encoders and receivers are decoders.

The communication has to be received, understood (decoded) accepted and result in some action. If this is achieved then the communication is successful. To know whether this is so or not, the sender has to find out his degree of success in communicating by taking a feed back from the receiver. We will also consider the words, message, medium and channel. The message, is what the sender is saying to the receiver, the medium, the carrier of the message. It could be written words, verbal, heard visual, touch, smell, taste, etc.

**Channel** : The channel of communication provides the sender with access to the receiver, such as press, telecommunication, radio television, face to face encounters of the receiver with the sender. Channels have both, small face to face discussions and mass media approach.

Two way communication - can be summarized as follows

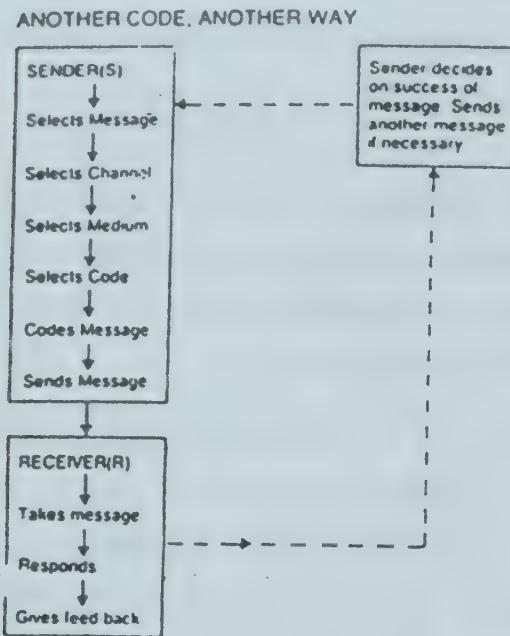


S - Sender

R - Receiver

RR - ?

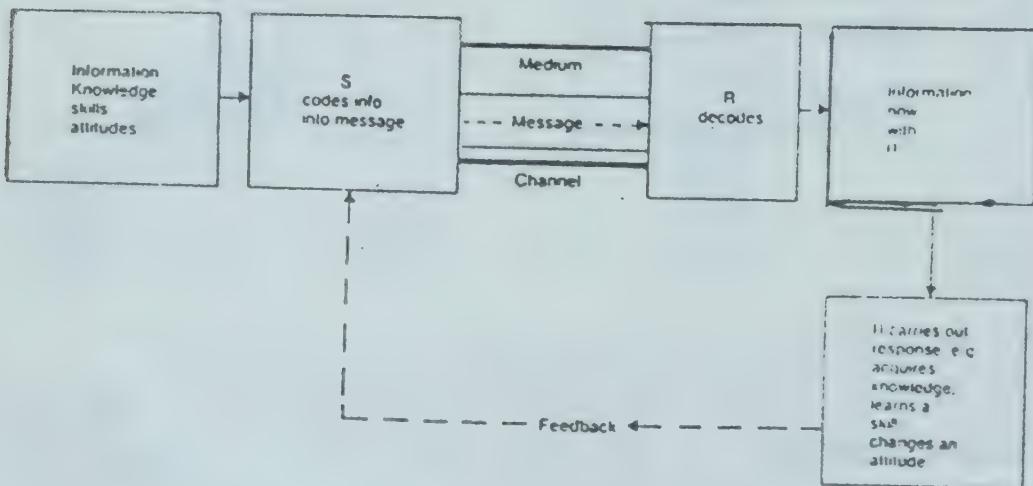
## ANOTHER CODE, ANOTHER WAY



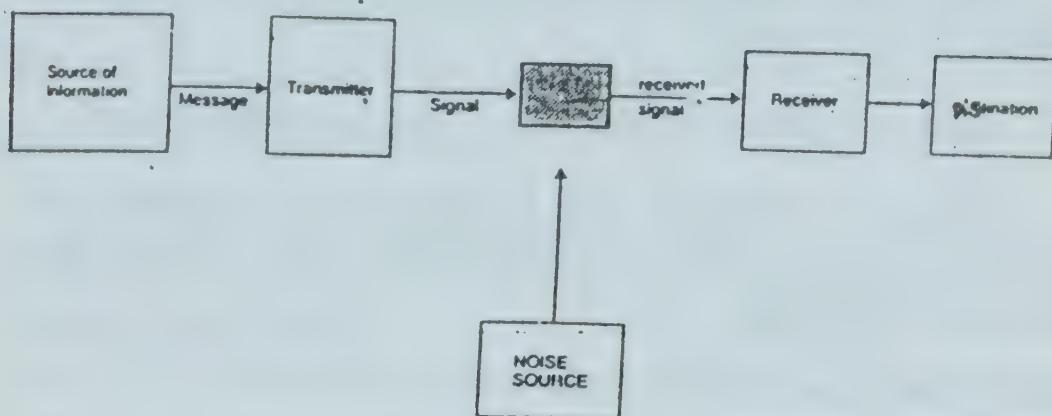
**FIGURE 3**

A final example of how we could have coded our message is shown in the next Figure, a "straight-line" or "flow" diagram. You will notice how each of the varying codes can be made to emphasise different parts of the message.

## TWO-WAY COMMUNICATION THE WHOLE PROCESS

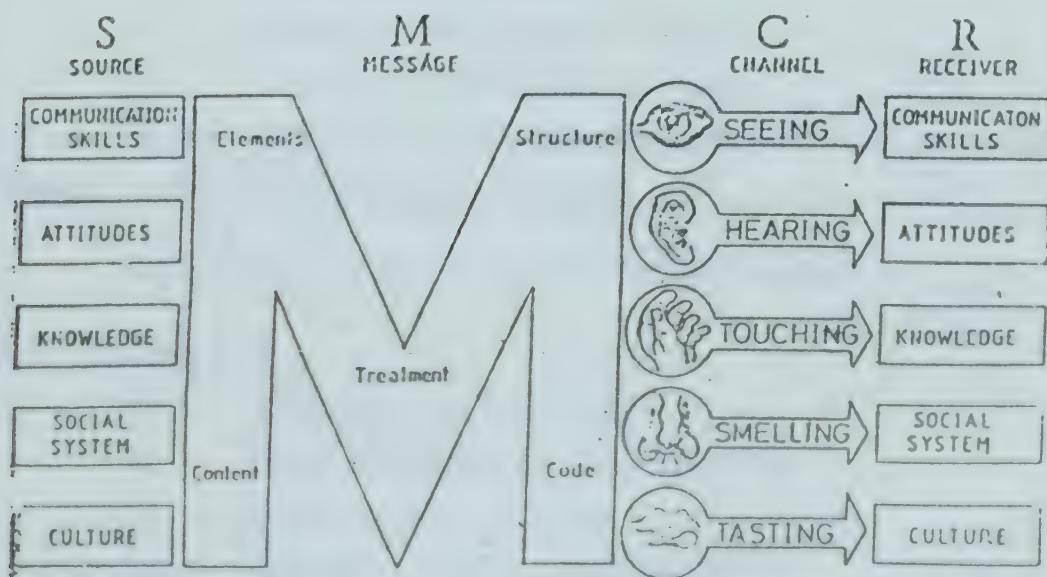


## SHANNON AND WEAVER MODEL



This model is similar to the earlier one except that it introduces an important new concept, that of 'Noise'. Noise is any interference with the message. Noise is barrier to learning. This model is linear rather than a loop and does not include feed back.

## The SMCR Model (After Berlo)



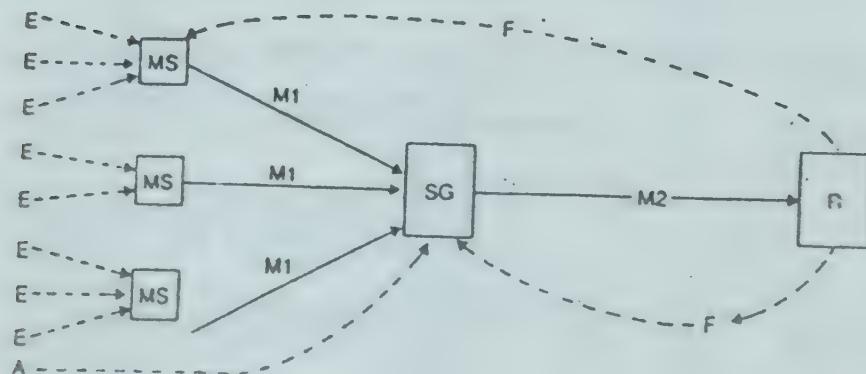
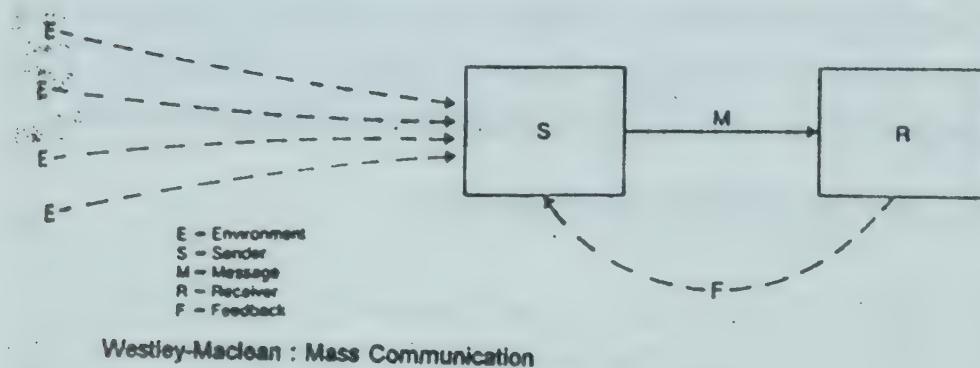
## Westley Maclean Model :

This has two aspects : communication between two people and mass communication.

Westley Maclean Model : Two way communication

Focuses on a specific item of his or her environment (E) and creates a message (M) for transmission to the receiver (R) and includes feed-back.

### WESTLEY MACLEAN MODEL COMMUNICATION BETWEEN TWO PEOPLE



E = Environment

MS = Mass communication

SG = Sender - Gate keeper

SG = performs the role of Trainer, Filters out the second message (M2) which is sent to (R)

R = Receiver

F = Feed back

M1 = Message

M2 = Message

SG- performs many roles of a trainer gets information directly from (A) or from (E) - (MS), focuses attention of trainee on aspects of training which are more important from the training point of view and also for trainees themselves.

### Barriers to Communication :

These are erected either by the trainers, or the trainees. These can be discussed under the following heads

- Training environment
- Awful assumptions
- Size of the group
- Prerequisite levels of trainee pre-test
- Forgotten feed back
- Attitudes of the teacher
- Psychological barriers
- Comprehensive comprehension
- Learner Mass
- Pointing and blinding
- the non-verbals
- Mediums which miss : "slow, quick, quick, slow", Silly structure, Generation gap net works
- Polarizing

### Barriers to communication erected by the trainees

- 1) Frame of References - Previous experiences
- 2) Relevance - Beliefs
- 3) Selective perception / Receive
- 4) Lack of motivation to learn
- 5) Meaning and understanding difficult language

Jargon, use of Terminology Jargon

Responsive steps for better communications

### Environmental

- 1) Noise to be minimized
- 2) Real attention to (M) listening
- 3) Reduce No. of links
- 4) Power - status - Barrier lower
- 5) Tailor Terminology
- 6) Use of multiple channels

## Personal

- 1) Improvement in perception
- 2) Develop proper frame of beliefs
- 3) Less use of symbols (or cautious use)
- 4) Reinforce words with consistent action and empathy

## *How to develop communication skills*

- 1) Learn to speak simple English
- 2) Practice teaching - Micro teaching sessions
- 3) Develop effective use of A.V aids
- 4) Develop proper attitudes towards your students and subject eg. sincerity, purpose, honesty, relevance, empathy
- 5) Seek feedback, test the understanding.
- 6) Good listening behaviour.

## Good Listening Behaviours :

- \* Clearing away feelings and thoughts from previous events
- \* Giving full attention.
- \* Checking that you have heard accurately (ask clarifying questions)
- \* Listening for the main ideas..
- \* Remembering that we are liable to switch off when we disagree and stopping ourselves doing that.
- \* giving encouraging signals.
- \* Looking at the person (though not too fixedly)
- \* Re-stating what you think you have heard if you are not sure about it, or the point is a little complicated.
- \* Reflecting back to the other the feelings he is expressing (if any they might not always be aware of this)
- \* Summarizing what has been said at the end (to allow the other to agree to that or to modify it)

### Things to avoid in Good Listening

- \* Jumping to conclusion
- \* Interrupting
- \* Talking too much yourself
- \* Thinking of what you want to say next
- \* Picking up minor points
- \* Ignoring what is being said
- \* Pretending to understand when you don't
- \* Being judgemental about what is being said
- \* Defending your own point of view and not being open to others ideas.

### To communicate successfully you should :

- 1) Have a clear picture of what you want the receiver to understand.
- 2) Try to orientate the receiver to the learning by making clear to him or her what the task is i.e. describe your objectives.
- 3) Make sure you have an idea of how skilled you are at sending and the receiver at receiving.
- 4) Make your message understandable to the receiver by using his or her own vocabulary and terms, i.e. code the message properly.
- 5) Whoever you are communicating with, try to keep your message simple.
- 6) Give your messages one at a time.
- 7) Repeat and reinforce where necessary.
- 8) Use analogies, metaphors and even anecdotes if necessary to make your message clear.
- 9) Decide which part of your message needs special emphasis.

## Medical Education Technology

- 10) Consider the use of as many media as suitable and make sure the media are appropriate.
- 11) Try to ensure adequate feedback/
- 12) Pace your message sending to the capacity of the receivers.
- 13) When giving learning messages follow the rules for sequencing i.e PROCEED from
  - the known to the unknown
  - concrete to the abstract
  - observation to reasoning
  - simple to the complex
  - the whole to the detailed view
  - deal with first things first, i.e. follow chronological order.
- 14) Try to understand the psychological state of the other person.
- 15) Sort out your own feelings about the subject of your communication and feelings of your receiver.

# GROUP DYNAMICS

## INTRODUCTION :

Some one said that Camel is a horse designed by a Committee. They were probably trying to make the point that small group experiences often end unsatisfactorily. By understanding small group communication we can avoid creating camels.

Small group is the face to face interaction of two or more persons in such a way that members are able to recall the characteristics of the other members accurately. A small group usually implies anything between five to twenty participants.

To conduct a small group discussion, one has to understand the dynamics involved in this. The fish bowl exercise is one such attempt to highlight these problems.

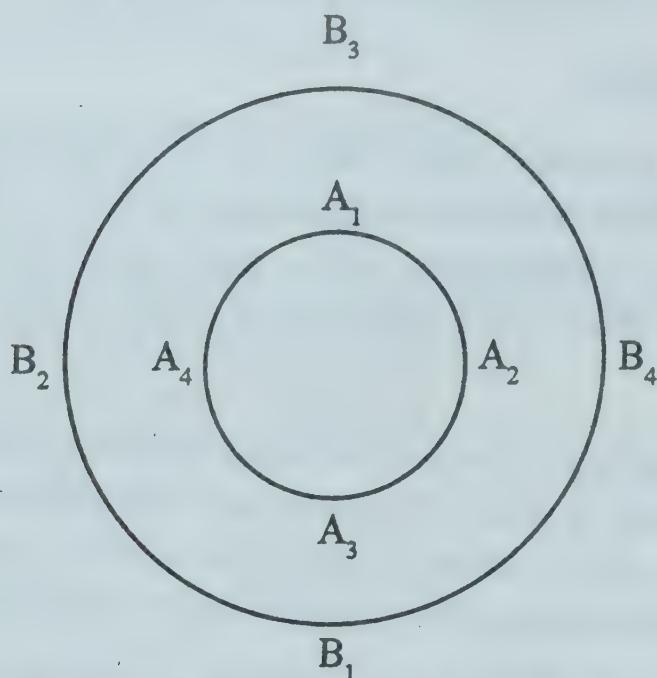
## PROCEDURE : (Ref. Fig.)

The participants will be randomly divided into two groups. Group - A is given a topic for discussion. The participants assemble in the form of a closed circle (inner) facing each other.

They start discussion on the given topic. Members in group-B sit in the outer circle and observe the discussion members. Each member makes specific notes of the behaviour of the specified member in the inner circle.

The groups will reverse their places. Group-B is given another topic for discussion. The members of group-A make specific observations of the discussion members.

At the end of the session, group interaction is shown by sociogram. The participants can identify who has participated most, who was silent etc.



Arrangement of the Groups :B1 to observe A1; B2 to observe A2;  
B3 to observe A3; B4 to observe A4

Many observers have found that groups develop according to common pattern described by Walton as "normal, forming, storming, reforming and mourning".

Group discussion is discussion by a group and not discussion by the instructor of questions raised by individual members of a group.

Group discussion requires interaction among students and between students and teachers - so its effectiveness depends heavily on the quality of students - teacher relationships. Interpersonal trust determines the success of a group discussion.

- 1) Teacher in a group discussion acts as leader, resource person and recorder.
- 2) Teacher should be very clear about the objectives of the discussion. It should be used for an intended purpose.
- 3) Teacher should weigh the advantages against what can be accomplished, given a number of realistic constraints - in terms of number, space and time.

- 4) Teacher should create an atmosphere conducive to discussion by
  - a) Formulating questions that give students as much permission to be wrong as possible.
  - b) Appropriately reacting verbally to student's answer - giving positive reinforcement
  - c) Appropriately reacting non-verbally: Eye contact, smiles, gestures.
  - d) Learning to WAIT patiently.
  - e) Getting as many students as possible to participate
- 5) Teacher should summarise every now and then - it is NOT a lecture.

### GUIDELINES TO THE DISCUSSION LEADERS

- 1) Make sure that all the members of the group know one another.
- 2) Ask the group to select a recorder.
- 3) Introduce the topic to be discussed.
- 4) Begin the discussion by identifying the various aspects, which he can use to promote group participation at the onset if necessary.
- 5) The teacher should prepare several questions in advance, which he can use to promote group participation at the onset if necessary.
- 6) Lead the discussion on each selected aspect. Encourage each member to state his/her views but also to listen carefully to other's views. help all members to understand the ideas presented, ask for restatement or simplification when necessary.

- 7) The teacher challenges individuals to explain or support assertions that are made, whether or not they happen to be correct.
- 8) Keep the discussion related to the topic, balanced and orderly.
- 9) Most of the questions directed at the instructor are not answered but instead are reflected back to the group for consideration by other students.
- 10) Individuals who are dominating the discussion are first gently, and if necessary, some what more vigorously invited to provide others with an opportunity to participate.
- 11) Students who are not participating are given encouragement to ask questions and express viewpoints.
- 12) Watch for indications that the group needs information. Members may consult references or ask a resource person to help.
- 13) When a decision is reached, make or request a participant to make a summarising statement for the recorder.
- 14) Introduce the next aspect of the topic and repeat the process until all the aspects have been discussed.
- 15) When the group session is completed, review the decision and help the recorder to complete a summary of the discussions.
- 16) The leader may present the summary in the general meeting or may ask the recorder or any group member to make the presentation. The leader must be prepared to answer any questions asked in the general meeting about his/her report.
- 17) The teacher should establish the rule that his own ideas are also subject to question and challenge.

## **GUIDELINES TO THE PARTICIPANTS FOR CONTRIBUTING TO THE GROUP DISCUSSION**

- 1) Address fellow members by name. Appreciate the positive aspects of the contribution of other.
- 2) Help the chairperson to keep up to the time schedule by speaking briefly and to the point and giving others the chance to speak. Avoid repetition.
- 3) Direct remarks to the group, not always directed to the chairperson or any one member.
- 4) Help the chairperson to move the discussion forward. Avoid bringing back issues once rejected by the group.
- 5) Offer facts and figures relevant to the subject under discussion and avoid authoritative generalizations.
- 6) Admit errors, disciplining yourself in the interest of group harmony.
- 7) Express opinion, without hesitation, though it may be of the positive view but be sure that it is related to the subject.
- 8) Suggest new ideas for presentation. Volunteer to use individual skills in various methods of presentation.
- 9) Strengthen remarks by giving facts from the working papers and reading materials to avoid too much personal opinion.
- 10) Help to draft a report that reflects accurately what the group thinks.
- 11) Don't hesitate to challenge or question or add to the group reports.
- 12) Be prepared to define and explain the group's decision in the general meeting.

# **TAXONOMY OF EDUCATIONAL OBJECTIVES**

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Planning for effective teaching begins long before the bell rings. Before entering into the class room, teacher defines clearly the instructional objectives of each lesson he teaches, and directs the instruction towards the accomplishment of these objectives.

Goals of Medical Education are promotion and maintenance of health of the community by means of improving the education of health personnel. It also ensures that educational programmes for health personnel are directly related to the needs of health system.

Educational objectives, sometimes referred to as behavioural objectives, are statements describing the characteristics and specific skills that the teacher intends to develop through instruction. These objectives pertain to student skills, knowledge and attitudes. It is a statement of what the student should be able to do at the end of the learning period, so that, the educational aims can be achieved.

Taxonomy - in simple words is a classification. It is borrowed from sciences. The educational objectives are inter-related and intangible entities hence the word, taxonomy, is used.

## **Intention or purpose of classification of educational objectives**

By stating the classification, the educator hopes to achieve three goals.

- 1) Impart precise meaning to
  - a) Educational aims
  - b) Student behaviours
- 2) Universally accepted way of expression of educational skills.
- 3) Provision of frame work against which
  - objective could be specified
  - evaluation devices framed.

### **Taxonomy of Educational objectives**

Purpose of education is to bring a desired change in the behaviour of a learner. Specifying the intended behavioural changes helps in formulating the instructional strategies which are to be employed and provide a frame work for evaluating the success or failure of these strategies. The different behavioural changes which are sought to be achieved constitute the educational objectives.

The educational objectives belong to three broad areas and these areas are referred to as domains :

- 1) Cognitive domain (knowledge)
- 2) Affective domain (feeling)
- 3) Psychomotor domain (communication and doing).

Medical Education is a skill oriented training and stresses for the development of three skills.

- 1) **Intellectual Skills** - involve ability to :
  - a) recall facts
  - b) interpret data
  - c) solve problems
- 2) **Practical skills** - include :
  - a) observation
  - b) imitation
  - c) perfection

**3) Communication skills - include :**

- a) receptivity
- b) response
- c) internalization

Setting the educational objectives will therefore, satisfy two basic principles in the education of health personnel:

**1) Relevance to the community health needs.**

**2) Active learning** - facilitates education, helps to develop competencies that are required from medical graduates to respond to the health needs of the community.

# MEDIA AND MEDICAL EDUCATION

## AN OVERVIEW

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### EDUCATIONAL TRIAD :

Learning is fundamental to survival of every organism. Everybody is a born learner and learning involves the learner, the learning situation and the learning process i.e the individual, the environment and their interaction. The individual begins to learn from conception and continues to do so throughout his life time. Based on his perceptual experiences, he builds a 3-dimensional representation of the environment. The experiences which are found to be more rewarding are reinforced. In fact, the individual attempts to manipulate his environment so that those experiences are enacted repeatedly for internal satisfaction. During his interaction with the physical, social and biological environment the human being develops attitudes that are unique to every individual. Indeed there are as many perceptual worlds as there are individuals.

In his eternal pursuit of happiness for internal satisfaction including anticipated ones, the individual interacts with other individuals, but the interactions which are more likely to be beneficial are favoured. Those events or individuals who have been capable of inducing a change in the behaviour of the learner may be regarded as teachers and the process of this interaction as education. An effective communication between the learner and the teacher is the cornerstone of meaningful education. This is all the more pertinent when one is reckoning with medical education where the product is being moulded to empathise with suffering fellow human beings. The formal apprenticeship that an entrant undergoes during his stay in the medical college has a

profound bearing in shaping his perspective towards life in general and medical profession in particular. The knowledge, skills and attitudes that need to be imparted to the learner require an amalgamation of as many modes of communication as is possible, by the teacher. Keeping in mind the multitude of signals which are competing for attention, access to the learning process of the individual is more likely to be gained when the message is routed through multiple sensory modalities.

### **Understanding Communication :**

When one wishes to be an effective communicator, an insight into the process of communication is a basic pre-requisite. Message, medium channel and context form the major components of communication. The knowledge, skill and attitudes which are being expressed constitute the message. The medium is the shape or form the message assumes, from the actual 3-dimensional object at one end of the scale to its complete abstraction in some symbolic form at the other end. Words, written or spoken, models, specimens, illustrations, photographs, graphics, simulations and demonstrations are but a few examples of media. The devices employed for conveying the message in different forms constitute the channels. Blackboard, posters, projectors recording and playback devices and television systems are few of the channels which are currently in vogue.

The environment in which teaching and learning occurs forms the context. Among the many variables that influences the learning process, the attitudes and aptitudes of the learner, as well as the size and nature of the audience play an important role in the selection of media and channels. Even the message has to be tailored to suit the needs and capabilities of individual learners. The foremost step in communication is the crystallization of ideas to form a unified message. In most instances, the content of the message decides the choice of the medium and the channel.

Interestingly, half the population of the world employs spoken word as the primary mode of communication. Establishment of visual symbols for the phonetic elements forming the written words has paved an unique avenue for dissemination of information among individuals, making the first step in the globalisation of education. The emergence of paper and printing technology ensured the recording of information that transcended the barrier of time. The recorded work of one generation was accessible for scrutiny and use by the succeeding generations. Even in institutionalised education, including medical education, spoken or written words form the mainstay of communication. However words, alone, whether spoken or written, cannot convey different facets of the message to the learner. They need to be supplemented with other symbolic forms for more effective communication. Involving multiple sensory modalities of the learner can definitely improve the learning process. The neuronal maps that are established to represent a given perceptual experience would be incorporating different facets of the same message which is being perceived through different sensors. Utilisation of the circuits so established for psychomotor expression would result not only in reinforcing the circuits but will ultimately lead to further refinements in the operation of the existing circuits.

The crucial question in the selection of a medium therefore, concerns the purpose for which it is intended. Illustrations provide a visual representation to the ideas being expressed. A graphical representation is more likely to be comprehended when the intention is to show the causal relation between different events. A three dimensional space filling model of a molecule like DNA goes a long way in understanding its behaviour rather than a line drawing of the same molecule. However, a line drawing would be more appropriate to depict the arrangement of genes on a segment of DNA molecule. In the same manner, specimens of sections of the brain cannot give an understanding of the neuronal circuits involved in the execution of various activities, while

schematic representation of the neuronal circuits can easily be comprehended. A photograph depicting the external features of an object would be less meaningful if the internal structures are to be seen. On the other hand external features of an object can be presented in an effective manner using a photograph. On the contrary, a still photograph is not useful for showing movements, a motion picture would prove handy. Similarly surgical skills can be shown by demonstration, either live or via television, where the emphasis is on actual visualisation of the skilled activity so as to help the learner to imitate and perfect it by practice.

### **The revolution in communication technology :**

Evolution of channels from medieval to modern times has been a fascinating saga of human history. The technological advances have occurred in three broad areas. The unsatiable thirst for understanding the intricacies of life processes has led to the evolution of imaging techniques. Simultaneously newer devices for recording, storing and retrieving information, virtually at the press of a button, also came into existence. But the area which has seen the most significant transformation and the one which has had the greatest impact on human behaviour has been in the field of transmission or relaying of information. With the advent of the computer and man's conquest of space, satellite communication has turned into reality, the once utopian dream of a global village. While the moral, social, cultural and ethical implications of this monumental achievement cannot be brushed aside, education in general and medical education in particular stand to gain tremendously.

A welcome fallout of the advances in recording and retrieval of information has been the opening up of new vistas for the teacher to interact with the learner. The educational packages termed as self learning modules can be regarded as recording of information for subsequent usage by the learner. The individual

learner has the freedom to pace the learning according to his capability and needs.

The induction of an element of interactivity and the provision for self-evaluation render the computer assisted learning programmes (CALs) further rewarding. The larger implication of these packages would be a reduction of the didactic monologues in the classrooms.

The concept of a classroom and programmed instruction may very well continue to be part of the educational process. It is certain too, however, that this will form but one among a variety of ways in which teaching and learning will occur. Well? What then is the role of a teacher. A singular advantage of institutionalised education is that it offers the teacher an unique opportunity to induce a desired change in the behaviour of the learner. A teacher cannot afford to neglect this responsibility. He has to become one of the media himself, a living embodiment of the ideals he professes and a role model for the learner to emulate.

## OVERHEAD PROJECTOR\*

Overhead projector (OHP) is a versatile teaching aid and is an effective communication device. It has the advantage that the lecturer faces the audience and this facilitates interaction with the audience. It is cleaner than chalkboard. Its optical system gives a bright evenly lit image which catches attention of the audience. The visual image can be modified during presentation. The components of a complicated diagram can be added in a logical sequence. It can be used in diffused day light and does not require special lighting or dimmed room. It can be used with other media e.g. 35 mm slides and television. It is easily produced and kept for future use.

### Using the OHP effectively :

For maximum efficiency in communication, keep the visual image and verbal message closely related. Reveal the first transparency only when required in order to demand attention from students and switch off projector between transparencies. Allow enough time for audience to read over the information. A small pointer, a pencil or pen should be used to point the important area on the transparency stage. It is distracting to point on the screen.

### Design of OHP Materials :

Transparencies should be carefully designed and prepared. There are certain basic requirements.

#### SIMPLICITY :

- \* Restrict the content of each transparency to one main idea. If the message is complex break it into a series of transparencies or use overlays to add details

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\*[Abstracted from *Media in Medical Education*; K.L.WIG CMET, AIIMS, New Delhi]

- \* Include only relevant details in diagrams and illustrations
- \* Outline illustrations and symbols clearly
- \* Use uncomplicated lettering styles, with a minimum of different styles in each transparency.

## BALANCE :

To achieve a comfortable visual effect, the details of the visual message need to create an equilibrium. For example, an illustration (diagram) should be balanced in relation to any lettering which may appear on it (consider its size and placement) and the space surrounding it.

## UNIT :

When all the details of a visual presentation clearly function together it will be unified and therefore more pleasing to the eye.

- Keep the message clear and simple
- emphasize the key message in each visual presentation;
- use colour and lettering with discretion
- use of arrows, space, heavy lines.

## FORMAT :

When designing OHP transparencies the format (dimensions of the projected image) plays an important role. In order to have a proper format ensure that the design elements on the transparency are compatible with the dimensions of the transparency stage.

- Position the visual message within the projected area of the transparency while using a frame.
- When using masks, layout the material so that it looks attractive when masked and unmasked.
- Consider and plan the number and logical sequence of overlays when preparing a base transparency with hinged overlays.

## PRODUCING YOUR TRANSPARENCES

### Material required :

Pens for use on acetate sheets should be non-scratch type, fibre or nylon tipped. Pens with spirit based inks are permanent markers and should be used in permanent records, which are to be stored for reuse. These can be erased with methylated spirit. Water based inks can be erased easily with a damp cloth, fine medium or broad tipped pens are available easily in a range of colours. Clarity and simplicity are the keys to legibility. Therefore

- Use a simple lettering style which is neat and large at least 6 mm for text and 9 mm for titles. Use upper case (capital letters) for titles or emphasis only. Lower case lettering is easier to read in large blocks of print.
- Use only one lettering style on each transparency. A mixture of styles can be confusing and less attractive.
- Space lettering such that it looks regular and even.
- Limit the quantity of written material on each transparency to 6 lines.

The most reliable test for legibility is to view the transparency from the farthest point in the room where it is to be projected. Lined paper or 6 mm lined grid sheets can be used as a guide for handwriting. Place it beneath the acetate sheet before preparing the message.

### Transfer Symbols :

Transfer symbols and letters are available in a range of colours and textures, especially produced for use with the overhead projector. They can be applied to original artwork or directly into transparency film. Commercially known as "Latraset" or "Rapitype" the letters or symbols are rubbed onto paper or acetate with a blunt tool such as the end of a pencil or pen.

Letters can be removed by peeling them off with sticky tape.

Typewriters with large size face can be used for lettering.

There are several machines available which can make transparencies from an original. Reproduction from books needs to be enlarged before being copied onto a transparent film.

Thermal Copier machines provide fast copying. For the thermal copy process the original should be heat absorbing or carbon depositing in character e.g. pencil or black ink.

**Photo copier** : Special transparency film can be fed into plain paper copier to produce permanent black images.

**Colouring Transparencies** : Colour and texture can be added to outline images in several ways :

**Adhesive film** : For large areas of even colour or texture sheets of adhesive film can be cut out applied to the acetate sheet. To prevent damage to the original outline add the adhesive film to the back of the transparency.

Use a scalpel or other sharp knife to cut the film accurately and remove all air bubbles by smoothing the surface of the film.

**Inks, Markers and Pens** : Areas of colour or texture can be produced with ink, broad-tipped marking pens and spray paints.

Although it is difficult to obtain an even distribution of colour over a large area, effective textures can be achieved.

**Overlays** : Areas of coloured acetate sheet can be added to an original transparency as overlays. An effective contrast can be made with a sharp white background.

## TWO USEFUL TECHNIQUES

### OVERLAYS :

The information from several acetate sheets can be projected simultaneously or in separate sequence, when additional sheets are hinged and overlayed on a base transparency.

This technique is particularly useful when a complex visual message is to be presented. Successive logical elements of the message can be projected, giving the operator the flexibility to build up or break down the complexity as required.

### PREPARING OVERLAYS ;

- Prepare a sketch of the total visual content.
- Select elements from the sketch for the base (projected first) and each overlay. For clarity, limit the number of overlays to four.
- Make separate transparencies for the base and each overlay.
- To ensure proper alignment of all layers, register each sheet to two guide marks on the base.

Attach the base transparency to the back of a cardboard frame (using masking tape) and the overlays to its face. Hinge overlays from all 4 sides of the frame.

- Place small tabs of masking tape to the loose upper corner of each overlays and number in logical sequence.

### USING OVERLAYS :

- A series of illustrations or diagrams can be projected in logical sequence and used to present a visual summary, e.g. pie chart.

- By adding colour to some overlays (or the base) elements of the message can be highlighted.
- Overlay sheets can be moved to re-arrange elements of a diagram.
- Movement can be simulated on any of the transparencies by adding polarizing film and projecting with a polarizing spinner.

## **REVELATION TECHNIQUE :**

The presenter can control the quantity of information from any one transparency by using mask and revealing parts of the message.

This simply means placing a piece of paper or card over areas on the transparency which is being projected for covering the information on it. The mask can be removed gradually as the information is required.

An alternative method of selective revelation is to attach hinged masks to areas of the transparency. The mask can be removed in order and give the flexibility to hide small or oddly shaped areas not easily hidden by a separate sheet of paper.

## **FRAMING AND STORING TRANSPARENCIES**

### **Framing :**

Although an acetate transparency can be projected unframed, there are several good reasons for framing it.

The frames can be prepared in various sizes. They add strength to the transparency in protecting the edges from damaged or curling. This is particularly important if the transparency is to be used frequently or by several different people.

A frame blocks the light at the edge of the transparency giving a neater projected image.

It makes filing and identification easier and ensures correct registration of overlays and marks. Frame provides a convenient border for writing notes. It will protect the surface of valuable or fragile transparencies.

### **Process :**

The process of framing is very simple. Select a frame which is compatible with the size of the transparency being used. Tape each side of the transparency to the underside of the frame - this looks neater and ensures the transparency will lie flat during projection. Place acetate sheet face down on back side of the frame secure with tape on each side.

### **Storing:**

It is important to store transparencies adequately so that they are protected from damaged and can be easily retrieved when needed. Store them flat, clean and interleaved with paper. Unframed transparencies may be kept in large envelops or holepunched and filed in ring binders. Framed transparencies are too high to fit into the standard filing cabinets unless they are tilted over. A separate storage cardboard box can work well. Transparencies with masks or overlays need special care to ensure they don't stick to each other when stored.

## **SOME INNOVATIVE APPLICATIONS**

- 1) A hexagonal pencil or a glass slide with an arrow drawn on it or plastic / cardboard arrows all make good pointers. The pointer must be laid flat on the transparency and not waved around. A glass slide can also be used for labeling a figure if there is no space to write on a transparency sheet.
- 2) Opaque objects laid on the stage of the projector are silhouetted.

For example,

A Smith-Peterson nail can be placed over a sketch of the fractured femoral neck while discussing fixation of fractures.

A cuffed endotracheal tube can be placed over the sketch of the respiratory passage and the cuff can be inflated while discussing traumatology.

Models can also be placed over the stage of the Overhead Projector.

## **VIDEO AS AN EDUCATIONAL STRATEGY**

A well planned instructional media enhances the learning process. Video is a powerful medium of instruction which motivates the viewers and can be used to achieve specific educational objectives. It is well established that impressions created by combinations of pictures, words and sound are retained by viewers longer than when they are only heard or read. Use of pictures, words and sounds enables the viewers to be attentive, helps to understand concepts and acquire information which is too complex for verbal explanation alone. Instructional media appropriately used helps to overcome the limitation of time, size and space.

Video provides a flexible play back system which can be used in a class room or small group situation. A video programme is useful as a self learning module. The video as media has the advantage of being able to provide display of movement and activity as well as to show inter relationships. Performance of physiological experiments showing end results and movement of cells can be shown. Recording of real life situations, signs of a clinical syndrome, emergency situations can be recorded and kept for use as and when required.

Video has several advantages over 35 mm slides. It is useful for displaying motion and provides instant replay of the

recording. This is especially useful for group discussion, analysis of performance of skill and critical review of examination of a patient. Video tapes are reusable. It is easy to achieve lip synchronisation on video tapes. Time lapse and animation can be recorded on video tape for educational purpose. It provides instant access to individual frames and can give instant feed back on performance at an interview. This feed back would be of value in improving communications skills. Video provides play back system which students can use for self learning. The tape can be stopped and viewing of any part of a video programme can be repeated as often as required.

A self learning programme of video cassette can be supplemented by a workbook which contains objectives of the programme and self assessment questions. Guidelines for working through the programme can be included in the workbook.

## **EQUIPMENT NEEDED FOR PRODUCING A VIDEO PROGRAMME ARE :**

- 1) Recording and playback camera.
- 2) Compatible VCR,
- 3) Television monitor, and
- 4) U-matic video cassettes

For outdoor shooting portable camera is required. For fixed locations basic camera and tripod are enough.

## **PLANNING A VIDEO PROGRAMME :**

Steps involved in planning are :

- 1) Define the educational objectives of the programme
- 2) Identify the target audience

The entry level of the audience and the advantages that the audience would get after exposure to this educational exercise

should be carefully considered. Factors which would motivate them to use the programme should also be noted.

- 3) Design of teaching strategies for using the video film should be decided earlier.
- 4) Organise the sequence of objectives.
- 5) Details of the educational process need also to be planned.

Points to be emphasised should be identified.

### **Design Programme strategies :**

The main components of a video are :

P - Picture  
A - Acitivity  
S - Sound, word, music

While designing the programme it is essential to have an optimum blend of pictures, action and sound. Visuals form the dominant component and should be used to catch attention of the audience. The audio component should be used to complement the visuals and should not distract from it. A careful planning of the script is therefore essential.

### **PLANNING THE PRODUCTION :**

- 1) Make a list of requirements :
  - i) People - specialists in the field
  - ii) Rare disease, case records
  - iii) Surgical operative procedure
  - iv) Latest medical equipment and its functioning
  - v) Graphs and other media-film strips to be included.
- 2) Programme format :  
Objectives, sequence location, resource,
- 3) Evaluation of the Programme : Critical assessment of the programme by experts for effectiveness.

- 4) Script : Note the shot sequence, type of shot and sound recording.

Script for video shooting is usually in two column format. Visuals on the left and sound on the right.

Guidelines for preparation of a video programme :

- 1) Select a topic and divide it into subtopics
- 2) Identify the objectives of the programme
- 3) Identify the target audience and their background level of knowledge.
- 4) Plan the content and identify the visuals. Select the shot- long shot, medium shot or close up.
- 5) Make the programme interactive by inserting questions and self assessment questions in the programme.
- 6) Provide topic organisers and summary at the end of the programme. Supplement programme with a workbook which would provide guidelines for proceeding with the programme and indicate to stages in the programme for answering questions.

# ATTRIBUTES OF A GOOD PROJECTION SLIDE

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Projection slides are a popular media among medical scientists and teachers. They improve delivery of the spoken message by visual reinforcement of the key points. They are particularly suited to large audiences. Good slides enhance the range, the speed and the depth of presentation. Poorly prepared slides, on the other hand can kill the rapport of the speaker with the audience. Slides should therefore be prepared carefully.

## 1) A good slide is SIMPLE :

Each slide should depict just one idea. It is better to build one's message by showing several slides, rather than dwell on a single detailed slide carrying all the information.

It should be possible to absorb the information on a given slide in 4 seconds. This is as long as it takes an average person to both look and listen with reasonable comprehension.

A good speaker would put minimum description on the slide, often just a few key words only.

## 2) A good slide is LEGIBLE

### 2.1 TEXT SLIDES

In a text slide :

- \* The typed area should not exceed 7.5 cm x 11.0 cm
- \* Number of words should not exceed 35, and number of lines should not exceed 6.

- \* Capital letters should be used sparingly. The slides with all capitals are not legible. Lower case ("Small") lettering gives characteristic shape to the words which helps in their recognition.
- \* For headings, larger point size is the ideal method. Capital letters can be used for short headings or for emphasis. Underlining is generally not recommended.
- \* Avoid the use of full stops. Other punctuation marks are also used sparingly.
- \* Placing cueing marks alongside a new item helps in improving the legibility. (please note the use of asterix in this text as cueing marks to improve readability).
- \* The material for slides should be printed bold and clear. Preferably use a laser printer. If routine typewriters are employed, use a good quality carbon. Placing a reversed sheet of carbon behind the typing paper produces a denser image more suited for slide.
- \* Abbreviations should be used with caution in a slide as the audience may not be aware of them.

## 2.2 NON TEXT SLIDES

- \* Maintain a ratio of 2:3 in the illustration
- \* Do not put complex tables on a slide. Simplify the information and use only 2 or 3 columns and rows.
- \* If graphs are used, again only minimum information should be put. Data points and lines should be bolder than the axes.
- \* Diagrams should be kept as simple as possible.

### 3. A good slide is ACCURATE

Do not make spelling mistakes or factual errors.

Remember, a large number of intelligent persons will be scrutinizing your projection.

#### 4. A good slide is APPROPRIATE

The project material must be in tune with what is being spoken.

Choose the best visual depiction for your idea. Often, a picture is worth a thousand words! And, may be a flow chart gives a better idea of what you wish to convey.

#### 5. A good slide is TECHNICALLY WELL-EXECUTED

The slide should be properly exposed and developed. Facilities for the various types of processes are variable at different places. Slides, can be negative, positive, diazo or full colour. Lith films allow colouring of the slide with dyes.

Coloured slides are certainly more attractive. Colour can be used for emphasis very effectively.

Computer - generated slides taken on colour films (using slide maker) provide tremendous scope for creativity.

Slide should be properly mounted. Mounting in the "Portrait mode" should be avoided as such a slide when projected would often go discarded.

The audience appreciates well-prepared and well-presented slides.

#### Reference :

- 1) Evans M., The use of slides in teaching : A practical guide, Association for the study of Medical Education : Medical Education Booklet No. 13, Dundee 1981.
- 2) Oakey M.J., Preparing graphics for projection slides. In Cox K, Ewan CE. The Medical Teaching. Edinburgh : Churchill Livingstone : 216-222.

# COMPUTER ASSISTED INSTRUCTION IN MEDICINE

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## INTRODUCTION :

The potentials of Computer Technology for revolutionizing higher education was analyzed in the study done for the Carnegie Commission on Higher Education in USA by the RAND Corporation under the direction of Roger Levien.<sup>1</sup>

The general picture presented is one of many capabilities available and few being utilized. Government agencies, industry and the higher educational institutions themselves will have to act to realise fully the Computer's Potentials, and students must demand that the faculty and administration perform their functions in this regard.

The impact of Computers is now being increasingly felt in India.

In May and June 1985 I undertook an extensive study tour of USA visiting the leading centres active in Computer-Assisted Instruction in Medicine. In this article I have evaluated the various types of material currently available in USA, and I have determined the one that is most suitable for immediate introduction in Indian Medical Colleges.

## THE LEARNING PROCESS :

In order to appreciate the impact of computer technology in medical education (both formal and continuing), it is important to understand the learning process itself - Once we understand it

and the attributes of the various technologies we will be able to ascertain in which steps a particular technology can most successfully strengthen the learning process and in which a given technology cannot usefully contribute or is relatively useless.

Rockart and Michael of the Massachusetts Institute of Technology, Boston USA, have proposed a operational learning model. Facts, skills and concepts have to be acquired, embeded, integrated and tested in the learning process. In the acquisition of facts, skills and established concept, cost effectiveness is the most important attribute and the text books and lectures provide the most cost-effective tools. For the embeding process, feed-back is most important, for which tutorial paper programmed learning (PPL) texts provided the most cost-effective tools. For integration learner control and manipulation of data are importantwhere in CAI is valuable. For learning new concepts, enrichment systems, emulation and data manipulation are important, where again CAI is valuable. For learning frontier concepts, adaptability is most important, and the cost-effective tool in this area, is the professional lecture or guidance.

Medical education had always been a self study, hence self-study aids are well-suited to its objectives. The important educational principles are that (i) learning should be an active rather than a passive experience, (ii) students should be given immediate feed back on their progress. A primary purpose of CAI is to provide an automated means for individualized students instruction, while serving large number of students simultaneously. The computer acts as a tutor, as a self evaluator, as a source of enrichment to the learner while maintaining user control over the process of learning. The computer also plays a supervisory role, reviewing areas where the student's knowledge is weak, and directing the student to supplementary learning material covering the areas of demonstrated weakness. In CAI each student can work at his own pace, receiving simultaneous reinforcement for correct work, and having access to special information and help when problems arise.

## PRE-CLINICAL CAI :

CAI programmes for pre-clinical medical students are basically self-study aids for learning factual information. Most are written in multiple choice format although some are "free text" tutorial interactions.

The PLATO (Programmed Logic for Automatic Teaching Operation) CAI system, developed by the Computer-based Education Research Laboratory (CERL) of the University of Illinois at Urbana Champaign has been in use for over two decades. Alpert and Bitzer reported that pre-clinical students using PLATO programmes required far fewer hours of faculty instruction (one-half to one-third as many) than students who relied on lectures.

The University of California provides a computer based self-evaluation programme for students for reviewing or testing themselves on course material. The Ohio State University at Columbus offers an Independent Study Programme (ISP) as an alternative preclinical curriculum, which is preferred by more than 25% of the class of students. The ISP covers the same medical education material as the lecture discussion programmes but allows the students independence to determine their rate of progress. The ISP consists of two segments: "Normal Man", which can be completed in about six months, and "Pathophysiology" which takes about nine months.

As an illustrative example, after a student has taken a computer lesson and test in microbiology the programme will give the following assessment:

"Overall, John, you got 25 out of a possible 51".

- 1) Knows basic definitions concerning metabolic processes.
- 2) Understand the relationship between bacterial metabolism and the metabolic processes of other living organism.

- 3) Applies a basic definition concerning metabolic processes to the classification of bacteria
- 4) Knows specific facts concerning three metabolic processes.
- 5) Knows basic definitions describing the oxygen requirement of bacteria.

This list goes on till all learning are covered and the individual question numbers with total are also given.

In summary, John at this stage of your learning, you.

- Have acceptable ability to recall facts and definitions.
- Had increased difficulty in understanding terms and relationship related to the media and oxidase test.
- Need help in the interpretation and application of that interpretation to metabolic processes
- Demonstrated less than desirable competence applying the biochemical test results in the classification of bacteria".

## **CAI IN UNDERGRADUATE CLINICAL EDUCATION :**

Medical students must not only build up a store of medical knowledge, but also become competent in the application of that knowledge to solve clinical problems. During their clinical training medical students must develop three distinct types of skills: manipulative, interpersonal and cognitive. For developing and testing manipulative and cognitive skills, different types of computer simulations are valuable. Medical students have to learn a variety of diagnostic and therapeutic procedures. The replicable performance simulation is useful where the learning outcome is an expected replication of a specific performance. The role of simulation have associated with them a guarantee applicability in the real setting. In medical education and medical practice there are many situations especially in emergency medical care, where procedures are definable, consequences of actions or decisions are definable and there is a certainty or known expectation between each action or decision and its consequences.

A good learning tool is the Computer simulation of Cardiac arrhythmias and their management by electrical defibrillation or pace-making. A student or intern or resident can be given valuable experience any number of times without jeopardising the safety of an actual patient.

In the University of South California, Abrahamson and his colleagues, have created a sophisticated mannequin (SIM-I) to teach manipulative skills, but its utilization has been limited.

The development of cognitive skills involves the learning of factual data and their application to solving clinical problems. The use of computer technology to teach clinical judgement can be compared to the LINK trainer for pilots. In the LINK, pilots are taught to fly in an automated environment that simulates both the cockpit of the aeroplane and the flying conditions that the pilot will face. The LINK Trainer is programmed to vary environmental stresses such as weather conditions in an unpredictable but natural fashion. The trainee must adapt to the dynamic stresses and manipulate the control to maintain stability of the aircraft on the correct course. Computer-assisted simulation of patients provides learning opportunities similar to pilot training.

#### **CASE (COMPUTER-ASSISTED SIMULATION OF THE CLINICAL ENCOUNTER) :**

In the encounter simulation an initial description of the patient and the setting is the only unsolicited information the user receives. The simulation does not present its information to the student but rather surrenders information as a consequence of student interaction. The student can access information from the computer freely from any section by typing in the appropriate section (history, physical examination, laboratory tests, etc.). Once in the desired section, a question, or the word for a physical characteristic or the name of a laboratory test will elicit an appropriate response. Diagnosis and treatment plan may be entered when the user has collected a sufficient amount of information

about the patient. If the student does not know at any point what to do next, he can ask for HELP, and the computer programme will suggest, based on the data already collected, the leading diagnosis along with their Bayesean probability, the best diagnostic test, and the best management plan. In addition, the user may ask for normal values of laboratory tests or for a review of all the items collected so far. The students' input is evaluated and compared with the critical concepts in each section which should have been addressed in arriving at a diagnosis. The programme can also give descriptions of individual diseases under consideration, if asked by the user.

CASE interactions are currently in use at various centres in USA eg, PLATO University of Illinois at Urbana-Champaign, Ohio State University, Columbus, Massachusetts General Hospital, Boston, Stanford University Medical Centre, Stanford, California. They cover cardiology, respiratory systems, gastro-enterology, neurology, paediatrics, ophthalmology, orthopedics, obstetrics & gynaecology, otolaryngology etc.

### **Dynamic Simulations :**

Apart from static simulation, dynamic simulation are also available which use a branched-tree structure. The computer determines the branching within the programme on a probabilistic rather than a fixed basis. Programme with such a structure have been developed on cardio-pulmonary resuscitation, hypertensive emergencies, cardiac arrhythmias, and diabetic ketoacidosis. The programme provides a reasonably close simulation of the way the actual patient would react to a particular management. For instance, in diabetic ketoacidosis, the student might maintain the patient's fluid balance by giving appropriate hourly. I.V. fluid yet not give sufficient insulin. The computer programme will point out that the blood sugar is still high. Similarly in a programme dealing with hypertensive emergencies, the user will learn the clinical pharmacology of the drugs used including dosage, routes of administration, onset and duration of action, contra-indications

and side effects. User's choice of different therapies will lead to different paths of the programme and different responses from the stimulated patient. The user thus gets an opportunity to experiment with various drug therapies before he faces the actual emergency.

Computerised dynamic simulation of clinical management has been successfully used in a training programme of paediatric neonatal ventilation management.

Computer simulation has recently been used to give doctors experience in running clinical trials, enterprises in which vast amount of money and time can easily be wasted by bad planning and management.

### **EXAMPLE OF A CASE SIMULATION :**

The THYROID programme developed by Hoffer and Steel<sup>5</sup>, at the Massachusetts General Hospital Laboratory of Computer Science (MGHLS) has a glossary list containing 19 physical examination items, 23 laboratory test items, 2 diagnoses and 14 therapeutic options. The HELP option allows selection of a teaching message on any item found in the glossary. A CONSULT option will guide the user stepwise to the correct diagnosis. In addition to teaching the diagnosis of thyroid disorders the THYROID programme reinforces two desirable clinical skills (1) Performance of a thorough history-taking and physical examination and (2) Concentration of relevant and necessary clinical information. Items which are considered relevant and necessary are listed and the user's selections are compared with this list. The user is informed which of his selections were appropriate, and which necessary items be omitted. The computer will also give the lowest cost of investigations at which the diagnosis could be arrived, and compare it with that incurred by the user.

Such programmes are not a replacement of the classical instruction, but a great help to develop a systematic and thorough clinical approach. The programme reinforces skills in problem recognition and clinical problem solving. Kemmis<sup>6</sup> reported favourably on evaluation of computerized patient simulations in use at the Glasgow Clinical Decision Making project at the Glasgow Royal Infirmary. "As students work through the case, there is no doubt that they imagine themselves to be real doctors working on real cases. The plot of the drama they are acting out is built into the machine; it controls the decision to be taken. Identification takes place, not through watching a character on a stage acting out a role before them but through participation in the play".

Edward Hoffer<sup>7</sup> has summarised the benefits of computer-simulated patients :

- 1) "Patients" with a variety of illnesses are readily and consistently available, either as predefined patient case, or an unlimited number of randomly generated cases.
- 2) The patients progress can be simulated over any desired time-span, through dynamic simulations.
- 3) The student can assume full responsibility for patient care without jeopardizing patient safety.
- 4) The student can proceed at his own pace without any interference and in a way that is private and non-punitive.
- 5) The student can gain experience in situations where actual practice would not be available or possible.
- 6) Reinforcement, comment, evaluation, instruction etc. can be given at any desired point during the interaction.
- 7) Weakness in clinical techniques or information can be pointed out in a manner conductive to learning.

## CONTINUING MEDICAL EDUCATION :

In recent decades the tremendous growth of new medical knowledge and techniques has solely tried the ability of practising doctors to stay up-to-date. Through the American Medical Association AMA/NET, the physicians and other health care professional can now use a low-cost computer terminal to obtain the latest information quickly and conveniently in their offices or homes. Information that could take hours to acquire through traditional channels can now be retrieved in minutes. For instance the Drug information Base will not only give the user comprehensive information of each of over 1100 individual drug preparations by name, but will identify drugs according to indications for therapy, special patient circumstances or for certain drug interactions. Critical additions and revisions and updating of information are done routinely.

The Disease information Base is designed as quick reference tool for general practitioners when they are making confirming a diagnosis, and for specialists in areas outside their immediate specialities, the user can request latest information on a specific disease in its entirety or for certain sub-topics under the disease listing.

With the same user terminal messages can be sent or received and even filed electronically; information can be distributed to one person or to select groups of people across the city or across the country in a minute, quite economically.

The continuing Medical Education Programmes developed at MGH covering at present more than 20 different clinical management areas, provide interactive, self-paced learning based on computer simulated patient encounters. Cases are designed to convey the essentials of efficient diagnosis and effective patient management, in regard to priority, safety, cost and temporal sequencing of decisions. These programmes meet the criteria for category I of the physician's recognition Award of the AMA.

More and more such programmes are available on microdisketts for use on personal computers, and their increasing use can be predicted.

## PROBLEMS WITH CAI :

CAI material in medical education has been written at a variety of institutions, each one preferring its own unique computer language and unique hard-ware. (eg. PLATO lesson in TUTOR language, the Ohio State University lessons in COURSEWRITER, Massachusetts General Hospital lessons in MUMPS Stanford University lessons in a dialect of LISP; Cornell University MEDCAT written in APL). As a result, programmes written at one institution are not usable by other. Programmes run on main frames are not available for micro-computers. Thus, lack of standardization of hardware and associated peripherals, lack of a composite list of available software which inevitably leads to duplication of effort, and decentralised faculty efforts lead to less than optimal utilization of CAI.

A most encouraging recent development is the commercial availability of authoring software which enables teachers to prepare lessons without any prior knowledge of computer programming. We can therefore rapidly produce lessons appropriate to Indian requirements.

Most programmes in USA are on main frames. For instance the PLATO lessons are run on CDC CYBER 73-24 and CDC 6500 with a memory which stores four million 60 bit words. Through an interface unit (CIV) on to standard Television Channel or microwave link, the main frame is linked to site controllers, each handling 32 terminals; the actual user is connected to them via telephone line. Apart from various parts of USA, PLATO systems are now located in Australia, Belgium, Canada, France, Israel, Korea, South Africa, Sweden, Taiwan and United Kingdom. Such inter-communication permits rapid, even instant exchange of information and teaching material.

The MGH programmes are available nation-wide in USA and in foreign countries over Telenet Communications network. This service is available round the clock, seven days a week. Any user need only to have access to a terminal or a computer which supports modern communication over the dial-up system. I am making active efforts to transport some of the lessons for use in India in the near future. Authoring of lessons will also be initiated. Networking from main frames as well as standalone personal computers will be utilized.

### COMPUTER AS AN EVALUATOR :

A major advantage of CAI is the capability of the computer to evaluate individual and group performance. The system generates reports regarding the objectives and skills that individual students have not mastered. For example say 56 per cent of student in a class missed objective 19 in Unit B. The problem could be that the questions are worded incorrectly or that new study materials are needed.

For testing students, question bank can be organized by difficulty or type of questions. Authors can tell the systems how many questions to present from the question bank for each objective and level. In this manner it can be ensured that even though tests are randomly generated, each test that is presented will emphasize the same content and be of the same level of difficulty. The effectiveness of a test is analyzed in terms of correct responses, difficulty index, discrimination index, high group response pattern and score range, and low group response pattern and score range.

I had the privilege of seeing in Philadelphia, at the headquaters of the National Board of Medical Examinations, a demonstration of the type of computerized examination that will be held from 1988 onwards, with the use of interactive video disc. It is high time we in India computerize our examinations to

ensure objectivity and uniformity and high standards of examination and evaluation.

## **RELEVANCE OF CAI IN MEDICAL EDUCATION IN INDIA :**

At present there are 113 Medical Colleges in India participating in undergraduate and postgraduate medical education. Furthermore, the 13000 medical graduates annually emerging from those institutions, and the over 200,000 practitioners of modern medicine already in the field, will need continuing medical education and a device for self-evaluation, functions, for which the computer is eminently suited.

One third of the admission to medical colleges are reserved for the under-privileged classes who have to overcome the handicaps of centuries of Socioeconomic and cultural discrimination. Disadvantaged students who have been limited by poor early education will need remedial, individualised learning programmes. The need is obvious, yet hardly any special effort has been made in this respect for the last 35 years. There is dearth of good, motivated teachers, who will have the necessary time and energy to undertake this task. CAI can provide learning opportunity in an individualized manner, allowing each student to proceed at his own pace, giving instantaneous feed-back and supervision, guidance and evaluation in a tireless manner. Computers are getting smaller, faster and cheaper, hence time is ripe to seriously consider CAI in our medical education. At the very least CAI will help to train better teachers even if they or their students may never use computers.

### **REFERENCES :**

1. Levien R.E., *The Emerging Technology: Instructional use of Computers in Higher Education* (1972), New York, Mc Graw Hill Book Co., pp. 46-73.

2. Rocket JR, Scott-Morton M., Computers and the Learning Process in Higher Education (1975) New York, Mc Graw Hill Book Co., pp. 22-26.
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# COMPUTER ASSISTED LEARNING

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Syn : Computer Aided Learning (CAL)  
Computer Aided Instruction (CAI) etc.

## Introduction :

Though Computer is made to function in a mind-boggling number of ways, all of it could be broken down to four simple functions :

- 1) Storage of Data
- 2) Retrieval of Data
- 3) Compare two data (Logic-function)
- 4) Do Arithmetic Operations on Data

While these functions are very simple compared to human mind, a computer is incredibly faster. What air-travel has done to human locomotion, the computer has done to human mind.

## Computer as a Tool of Learning

Computer can be made to assist learning in these ways :

- 1) Dense Storage of data in an organised form, e.g. a large textbook could be stored in a classified manner on a 13 cm. disk.
- 2) Quick access to the data-base in milliseconds.
- 3) Logic-function can compare learner's responses and give appropriate feedback and reinforcement.
- 4) Keep track of learner-performance, award marks and give instant feed-back of evaluation (both formative and summative types).

## Computer as a Teacher

Computer can never replace a teacher. It merely complements teacher's role. However, in some area of interaction, it is better than human teacher. e.g.

- 1) It never gets bored or irritated
- 2) it never makes mistakes on its own
- 3) it permits individual attention (1:1 interaction)
- 4) It permits learner to decide his own pace of learning.

### Role of Computer in C.A.L.

A variety of roles/modes are possible giving much flexibility.

#### 1) DRILL and PRACTICE mode

Here, the learner can learn facts and memorise them by drill-method ; or use an MCQ bank for practice. This mode is used in remedial education programme for slow-learners.

#### 2) TUTORIAL mode :

Here, a well structured programmed learning unit (or CAL module) provides for interactive learning. This mode, if used well, could result in 90% retention of the content (compared with 30% retention after the best lecture).

In Tutorial mode, a module (lesson) consists of :

- a) presentation of content in a structured way,
- b) task-prescription to elicit learner's response, and
- c) instant feedback and reinforcement to the learner.

#### 3) LABORATORY mode

Computer could be programmed to simulate a variety of biological processes to supplement or do away with laboratory experiments. The learner explores various options and learns by inference.

#### 4) CASE-SIMULATION mode :

A variety of diagnostic and therapeutic problems of the patient management type could be effectively computerised. This has proved quite useful in learning problem-solving, the highest cognitive domain.

SPMP (Simulated Patient Management Problems) is one of the most useful areas of CAL in medical education.

#### 5) Consultant Role

It is one of the frontier areas now.

"Expert" programmes have devised with artificial intelligence (AI). These could bring the expertise of a consultant within easy reach of a primary care physician.

#### 6) Manager of Educational Process

Computer based management-information-system (MIS) could keep track of student performances and offer suitable advice to make the process more effective.

#### Problems and Limitations :

- 1) Inherent Limitations : Of the three domains, viz. cognitive, affective and psychomotor, to be developed in a learner, CAL could be very effective in cognitive domain - especially problem-solving skills. It may be of very limited use in the other two domains.
- 2) Content : All topics or subjects are not suited for CAL (e.g. Literature). Only topics that are logical or that could be well-structured are suitable.
- 3) Programme Development : This is a tedious and time-consuming process; e.g. it takes about 200 hours to develop a CAL module of 45 to 60 minute duration. The programmes that are developed for a particular computer system are often

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not transportable to other systems. Moreover, obsolescence of computer equipments is too rapid necessitating frequent revisions of these programmes.

- 4) Faculty Involvement is limited to computer-enthusiasts and hobbyists as there is no official recognition of the time spent in CAL programme or for the CAL modules developed.
- 5) Evaluation of the use of CAL programmes in medical education is not standardised.
- 6) Cost-Effectiveness is perhaps the most difficult area to analyse. This is compounded by the poor transportability of programmes between different computers.

### *Reference :*

- 1) Computer Assisted Learning - Medical Teacher : 8-4.7, 1986.
- 2) Introduction to CAL - by Keith Hudson, Chapman and Hall Ltd., 1984.
- 3) Hoffer EP and Barnett GO : Computer Aided Instruction.
  - In A flexible design for health profession education - by Jacobs RM. John Wiley and Sons, 1976.

## SUMMARY OF CHARACTERISTICS OF INSTRUCTIONAL MEDIA

Material	Advantages	Limitations
PRINTED MEDIA	<ol style="list-style-type: none"><li>1) Include common type of materials</li><li>2) Have wide variety of application</li><li>3) Simple types quick to prepare</li></ol>	<ol style="list-style-type: none"><li>1) Sophisticated types difficult to prepare.</li><li>2) Requires suitable reading ability</li></ol>
DISPLAY MEDIA	<ol style="list-style-type: none"><li>1) Useful in any kind of room without special adaptations</li><li>2) Allows user to be flexible for making changes as presentation proceeds</li><li>3) Easy to prepare and use materials</li></ol>	<ol style="list-style-type: none"><li>1) Limited to use with small groups</li><li>2) Requires some showmanship on part of speaker</li><li>3) May not be accepted as important media forms when compared with projected types</li></ol>
OVERHEAD TRANSPARENCIES	<ol style="list-style-type: none"><li>1) Can present information systematic, developmental sequences</li><li>2) Use simple-to-operate projector with presentation rate controlled by instructor</li><li>3) Requires only limited planning</li><li>4) Can be prepared by variety of simple inexpensive methods</li><li>5) Particularly useful with large groups</li></ol>	<ol style="list-style-type: none"><li>1) Require special equipment, facilities and skills for more advanced preparation methods.</li><li>2) Are large compared with other projectors</li></ol>

## SUMMARY OF CHARACTERISTICS OF INSTRUCTIONAL MEDIA

Material	Advantages	Limitations
<b>AUDIOTAPE RECORDINGS</b>	<ol style="list-style-type: none"> <li>1) Easy to prepare with regular tape recorders</li> <li>2) Can provide applications in most subject areas</li> <li>3) Equipment for use in compact, portable easy to operate</li> <li>4) Flexible and adaptable as either individual elements of instruction or in correlation with programmed materials</li> <li>5) Duplication easy and economical</li> </ol>	<ol style="list-style-type: none"> <li>1) Have a tendency for overuse, as lecture or oral textbook reading</li> <li>2) Fixed rate of information flow</li> <li>3) Low fidelity of small portable recorders.</li> </ol>
<b>SLIDES SERIES</b>	<ol style="list-style-type: none"> <li>1) Require only filming with processing and mounting by film laboratory.</li> <li>2) Results in colourful, realistic reproductions of original subjects</li> <li>3) Prepared with any 35 mm camera for most uses.</li> <li>4) Easily revised and updated</li> <li>5) Easily handled, stored and rearranged for various uses.</li> <li>6) Increased usefulness with tray storage and remote control by presenter</li> <li>7) Can be combined with taped narration for greater effectiveness</li> <li>8) May be adapted to group or to individual use.</li> </ol>	<ol style="list-style-type: none"> <li>1) Require some skill in photography</li> <li>2) Require special equipment for close up photography and copying.</li> <li>3) Can get out of sequence and be projected incorrectly if slides are handled individually.</li> </ol>

## SUMMARY OF CHARACTERISTICS OF INSTRUCTIONAL MEDIA

Material	Advantages	Limitations
FILM STRIPS	<ol style="list-style-type: none"> <li>1) Are compact, easily handled, and always in proper sequence</li> <li>2) Can be supplemented with recordings</li> <li>3) Are inexpensive when quantity reproduction is required</li> <li>4) Are useful for group or individual study at projection rate controlled by instructor or user</li> <li>5) Are projected with simple lightweight equipment</li> </ol>	<ol style="list-style-type: none"> <li>1) Are relatively difficult to prepare locally</li> <li>2) Require film laboratory service to convert slides to film strip form unless special camera available.</li> <li>3) Are in permanent sequence and cannot be rearranged or revised.</li> </ol>
MULTI-IMAGE PRESENTATION	<ol style="list-style-type: none"> <li>1) Can demand attention and create strong emotional impact on viewers</li> <li>2) Can compress large amounts of information in short presentation time</li> <li>3) Provide for more effective communications in certain situations than when only single medium is used.</li> </ol>	<ol style="list-style-type: none"> <li>1) Require additional equipment, complex set up, and careful co-ordination during planning, preparation and use.</li> <li>2) Equipment and production cost high for complex programmes</li> </ol>

## SUMMARY OF CHARACTERISTICS OF INSTRUCTIONAL MEDIA

Material	Advantages	Limitations
<b>VIDEO AND FILM</b>	<ol style="list-style-type: none"> <li>1) Particularly useful in describing motion, showing relationship &amp; giving impact to topic.</li> <li>2) Allow instant replay of video recording</li> <li>3) Videotape reusable</li> <li>4) Easy to record lip synchronization on videotape</li> <li>5) May include special filming techniques (animation, time-lapse)</li> <li>6) Combine still and motion on videodisc</li> <li>7) Standardized film projector available everywhere</li> </ol>	<ol style="list-style-type: none"> <li>1) High cost of studio production equipment</li> <li>2) Resolution limited with video for the detail close ups</li> <li>3) Incompatibility of video format types</li> <li>4) Value of investment in motion picture equipment reduced as video replaces film</li> </ol>
<b>COMPUTER ASSISTED INSTRUCTION (CAI)</b>	<ol style="list-style-type: none"> <li>1) Presents text information and graphic images</li> <li>2) Interacts with learners on individual basis through asking questions and judging responses</li> <li>3) Maintains record of responses</li> <li>4) Adapts instruction to needs of learner</li> <li>5) Controls other media hardware</li> <li>6) Can interface computer and video for leaner controlled programs</li> </ol>	<ol style="list-style-type: none"> <li>1) Requires computer and programming knowledge</li> <li>2) Require essential hardware and software for development and use.</li> <li>3) Resolution of graphic images limited on microcomputer systems.</li> <li>4) Effective when used by only one or few individuals at a time.</li> <li>5) Incompatibility of hardware and software.</li> </ol>

# CRITICAL APPRAISAL OF CURRENT M.B.B.S. EXAMINATIONS

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We have more than 10,000 MBBS graduates coming out of different universities every year and criteria/pattern of examination set at these, are different. All the universities agree that the candidates must be examined in the theory as well as practical skills. But do we actually do this during the examinations? Very few universities have set guidelines prescribed for the examiners to pass or fail a candidate. Many a times these are also not strictly adhered to by the examiners. Therefore, the students and teachers have lost faith in the present system.

Medicine is a skill oriented profession and needs to be learnt at the bed-side rather than sitting in library or with the computers. There is a lot to be learnt in the the way of communication and also human behaviour and none of the agencies test these while certifying.

As prescribed by the Medical council of India, the course consists of 3 phases :

Phase - I : Pre clinical - 1 1/2 years

Phase - II : Paraclinical - 1 1/2 years

Phase - III : Clinical - 1 1/2 years

and at end of every phase there is a qualifying examination in theory and practicals.

## Student's perception of examination :

### *Ist Phase :*

- Enough attention was not given to teaching applied Anatomy and not at all asked in the end examination.
- Physiology, amphibian experiments were obsolete and irrelevant.
- Tests in biochemistry were not useful and too much emphasis was given for theory rather than its applications.

### *II nd Phase :*

- Too much of histopathology rather than relevant haematology or clinical pathology.
- Relevance of culture and characters of organism is not stressed in Microbiology. Need to be examined more on clinical microbiology and interpretation of tests.
- Pharmacology - should delete pharmacy practicals and must concentrate on prescription writing on common ailments. Forensic Medicine - no training in court procedure and questions asked at the end - examination are more theoretical rather than practical. practicals - judge only theoretical knowledge but never autopsy or autopsy findings.

### *IIIrd phase :*

Major disciplines - Medicine, Surgery and Obstetrics and Gynaecology

- Cases selected for the examination were uncommon from the point of view of the primary care physicians.
- the artificial division of cases into short and long cases were an anathema to them.
- Discussions often ended at diagnosis leaving management skills untested.
- In the absence of specific guidelines, the marking in

clinicals was entirely subjective and many a times erratic.

- There is inadequate time to think and answer.
- Attitudes which are very important in clinical medicine are ignored and not tested at all.

The current system tests only recall and very little emphasis is on psychomotor and not at all on communication skills. Therefore at the end of the degree course one is not sure whether the graduate is adequately qualified to carry out his responsibilities as a family physician or not.

Three most important aspects of an evaluation system are validity, objectivity and reliability. None of these can be applied to the current examination system. Therefore every teacher in a medical college has to ponder upon the relevance of his teaching in the light of the objectives of medical education. The present evaluation system has become irrelevant and obsolete. Therefore there is a need to change the present system to a better evaluation system.

There are a few questions to be answered before we start changing the current system.

Following are the questions :

#### **Questions for Theory Examinations :**

1. To what extent our present theory examinations sample the subject content ?
2. What proportion of questions should be asked to test the understanding and applied aspects of knowledge?
3. a) What proportion of questions should be of eassy type, long essay type and modified essay type?  
b) Should a theory paper have both eassy type and multiple choice type (MCQ)? If so, in what proportion?

4. a) Should there be editing of question paper?  
b) should the question paper be moderated by the internal examiner to avoid repetitions?
5. Should there be central valuation for theory paper?
6. a) Should there be separate minimum pass marks for theory?  
b) What should be the minimum pass marks for the combined theory paper containing essay and multiple choice type of questions?
7. Is there need to improve the consistency in awarding marks for answers to essays type of questions. How could it be done? How can objectivity be improved?
8. Should we have model answers for the questions?
9. What proportion of marks to be considered for moderation?

*Questions for Practical Examination :*

1. Are the skills tested relevant to the needs of medical practice?
2. Should all the tasks be of uniform difficulty?
3. Can the task be performed within the time allotted?
4. Is the evaluation an estimate of :
  - a) Proficiency in the procedure
  - b) the accuracy of the end result, OR
  - c) a combination of (a) and (b).
5. Is the proficiency expected 100% or do you allow margin for errors? If so, what is the acceptable level of proficiency?
6. How do you ensure consistency of scoring?
7. Is the evaluation objective? If not, what are your

suggestions to make it more objective?

8. Should some proportion of marks in the practicals in the university examination be derived from internal assessment examination?
9. If the answer to question 1 is 'No', what kind of activities would you consider relevant in your speciality with reference to practical examination?

#### *Questions for Clinical Examination :*

1. Is time allotted for clinical examination adequate for :
  - a) Examination of a case?
  - b) Bed side viva voce?
2. What is the RELEVANCE of this procedure to testing clinical competence in medical practice?
  - a) long case
  - b) short case
  - c) Spotters
3. Does the examination system permit testing of all the abilities needed for clinical decision making process?
4. Should the emphasis be on the diagnosis made or on the procedure steps carried out by the candidate? If procedure steps are to be assessed, how can we do it?
5. What should be the weightage to different elements of clinical skills (like history, physical examination, diagnosis, plan for management, etc.,)
6. Is there a need to improve consistency in awarding marks (objectivity)? How could it be done?
7. Is there a need to ensure that similar abilities are tested and that all students face equal difficulty? How could it be done?

8. Should there be minimum pass marks for clinical examination? Is the existing minimum requirement of 50% fixed arbitrarily or is there a basis for that?
9. Should internal assessment include clinical performance of the student? What should be its weightage?
10. Should clinical examination be made criterion-referenced? If so, how can it be done?

#### *Questions for Oral Examination :*

The purpose of the oral examination is to test qualities/abilities that are inaccessible by other methods.

1. What are those abilities? Can concrete examples of those abilities be prepared?
2. What are the common shortcomings of oral examination in testing learning outcomes?
3. Are questions of similar difficulty level asked?
4. Should examiners have prior discussion to standardise question and agree what constitutes appropriate answer?
5. Could examiners carry a list containing questions?
6. Would it be possible to test some of these qualities : alertness, honesty, confidence, self-awareness, logical argument?
7. How can oral examination be improved?
8. How to improve the consistency in scoring?

#### *Questions for Internal Assessment :*

1. What are the problems in the current system of internal Assessment (IA) :
  - Validity
  - Objectivity
  - Domain tested
  - Evaluation procedure

2. Should IA be confidential / transparent?
3. Should weightage for internal assessment be uniform for all subjects?
4. What should be the weightage?
5. Should marks for IA be counted only for theory or also for clinicals/practicals?
6. Should mark given for IA be counted for Pass/Fail?
7. Should the procedure for IA be uniform or left to individual departments?
8. How many minimum tests to be conducted?
9. How will IA marks be calculated?
  - Average of best three scores
  - average of best five scores
  - all
10. What should be the weightage for IA in the non-examination specificities?
11. What should the procedure be for improvement of IA? How many tests, and at what intervals?
12. What are the reasons for student's resistance? How to overcome them?

**RECOMMENDATIONS OF THE WORKSHOP  
FOR SENIOR TEACHERS HELD AT  
J.I.P.M.E.R., PONDICHERRY, FROM APRIL 6-8, 1995.**

**1.1 Essay type of questions**

a) The long essay type of questions should be structured as far as possible. To increase the range of subject areas tested and for wider content sampling, different types of questions may be framed and their proportions may be as follows

## Medical Education Technology

Type of question	Long essay	Short essay	Structured essay
Proportion of question to total number of questions	20-25 per cent	30-40 per cent	30-50 per cent

b) At present the questions are mostly of recall type. Questions testing higher cognitive abilities like understanding and application should also be included in a question paper. The following proportions were suggested as guidelines :

c) At present the questions are mostly of recall type. Questions testing higher cognitive abilities like understanding and application should also be included in a question paper. The following proportions were suggested as guidelines :

	Type of questions		
	Recall	Understanding	Applied aspects
Pre-clinical	50 per cent	25 per cent	25 per cent
para - clinical	50 per cent	25 per cent	25 per cent
Clinical	45-50 per cent	30-35 per cent	20-25 per cent

c) To ensure that questions were confined to the syllabus and were not repeated either in different sections or in different sections or in different papers in subjects having more than one paper and to conform to the model question paper, it was recommended that moderation and editing of the question paper set by external examiners be done preferably by the internal examiner of the concerned subject.

Central evaluation of answer scripts was recommended for universities having more than one college affiliated.

There is minimum marks prescribed for theory in many universities. Wherever it is prescribed, it includes marks obtained in internal assessment and oral examination. A minimum of 40 per cent total marks allotted to theory papers was recommended for passing in university examinations.

No minimum marks was recommended for internal assessment.

It was recommended that efforts must be made to improve the consistency in scoring by allocation of specific marks to the structured questions or to different elements of questions and by providing model answers by the paper setters.

## 1.2 Multiple Choice Questions :

Multiple choice questions "(MCQ) were not recommended for University examinations. They may be used for class tests and internal assessment examinations.

In some universities, theory papers include both essay type of questions and MCQs/ Usually about 20-30 MCQs are asked. Combined theory paper containing essay type of questions and MCQs are not recommended as it affects the reliability. Atleast 100 MCQs should be asked for good discrimination. Therefore, if essay and MCQs are to be used for university examination, a separate paper is recommended for MCQ instead of present practice of a separate section of a paper. Separate pass marks should be fixed for the essay and the MCQ sections.

## 2. ORAL EXAMINATION :

### The Need for Oral Examination

Should there be oral examinations ? This issue was extensively discussed. It was felt that oral examination is a useful evaluation method. Despite certain drawbacks it may be continued, where necessary, with some modifications.

The purpose of oral examination is to test abilities inaccessible to other methods. These abilities were identified as higher cognitive skills, conceptual knowledge, logical reasoning, empathy, sensitivity, alertness, confidence and communication skills.

Many drawbacks were identified in the way oral examinations are conducted now. They were lack of a congenial atmosphere, lack of objectivity, personal bias, examiner variability, repetition of questions, inability to frame questions of similar difficulty and lack of training of examiners. Further, the time duration of oral encounter was not uniform. The duration was longer for students appearing in the initial stages of examination compared to those appearing in the later part.

### **Suggestions :**

*The following recommendations were made :*

- i) To bring about uniformity and objectivity and reach consensus about questions, answers and scoring procedure, prior discussion may be held among examiners.
- ii) The subject may be divided into portions or systems and each examiner cover designated portion or a system. This would help in wider content sampling and avoid overlap.
- iii) The examiners could either sit separately or in pairs of one external and one internal examiner.
- iv) The examiners could carry a list containing questions that are to be asked.
- v) A question bank containing questions to test different types of abilities earlier and of different levels of difficulty may be developed in various subjects.
- vi) The examiners should ensure congenial atmosphere, appreciate good answers and restrain from passing adverse comments or personal remarks.
- vii) Each student should be examined for atleast a minimum of 10 minutes for adequate and equal verbal interaction and not more than 20 students should be examined by an examiner in a session/day.

## Weightage for Oral Examination

No Particular weightage was recommended for internal assessment. In the university examinations, the preclinical group recommended that the weightage should not exceed 20 per cent of total marks for practical examination. The para-clinical subjects group felt that there was no need to hold it separately, and questions could be asked during spotters/practical examination. The weightage for oral component could be 20 per cent or even less or total marks for practical examination.

The clinical subjects group observed that oral examination in their subjects are generally held in the afternoons following clinical examination of long and short cases in the forenoon. The group recommended that instead of holding clinical and oral examination separately, the two may be merged. This would allow more time to each candidate. During this 'extended clinical examination', the candidates may be shown the relevant or related X-rays, specimens and instruments and questions asked about them along with the clinical examination.

### 3. Internal Assessment (IA) :

The following is the consensus reached both by the faculty groups as well as students :

1. IA is very important and must continue. However, there is need to increase students' confidence in the various methods and procedures adopted for IA. Therefore, they may be made as objective, open and transparent as possible. Some suggestions are made in this regard :
  - 1.1 The marks of only notified examinations or tests should be considered.
  - 1.2 A minimum of one week notice should be given for the tests or examination.
  - 1.3 As far as possible, objective methods of evaluation should be adopted.

- 1.4 The departments should evolve broad guidelines so that all teachers in departments are associated in the IA so that bias, if any, is reduced. Further, the effect of variations between individual teacher's maximum and minimum marks' may be eliminated by applying standardised formulae. Initially marking may be in the form of a four or five point grade system and finally at the time of sending the marks to the university the grades may be converted into numerical marks. Marks or grades of all notified tests/examinations should be displayed. Wherever applicable valued answer scripts must be returned to the students and feedback given.
2. The weightage for IA must be 25 per cent of the total university examination marks. The weightage should be uniform for all the subjects. This may gradually be increased later on.
3. IA marks should be counted for deciding pass or fail in a subject. There should be separate marks for internal assessment for theory, practical and clinical tests and these marks should be added to the corresponding in the university examinations for passing the results.
4. A battery of methods like written tests using short essay, structured essay, modified essay type of questions, MCQs, short assignments orals, role play, practicals and clinical bedside tests may be employed.
5. While it may be feasible to recommend the maximum number of tests for IA in each subject, a minimum of four (4) tests are recommended in every subject. The worst score of a candidate in any of these tests may be omitted and the average of all others  $(n-1)$  be taken for final calculation.

6. A student may be allowed to be absent for a valid reason for any one test only. For all other absence from the tests, zero (0) marks would be awarded.
7. Eligibility to appear for university examination shall be independent of number of marks scored in internal assessment. There shall be no minimum marks prescribed for a student to appear in the university examination.
8. In the clinical subjects, wherever a student is posted for atleast four (4) weeks, that department should conduct atleast one test. The marks from this test must be added to the marks in the corresponding examination subject - medicine and surgery.
9. For those candidates who have failed and have applied for improvement of IA marks, a minimum of three (3) tests or assignment must be conducted before the next university examination. Marks obtained in these should be considered for improvement of IA.

#### **4. PRACTICAL EXAMINATION :**

##### **Pre-clinical :**

- i) In Anatomy, dissection skills are not assessed. Dissection is done as a learning tool. The laboratory procedures tested in practical examinations of Physiology and Biochemistry are relevant to the needs of medical practice, but relevance of the examination in histopathology staining is doubtful and requires reconsideration.

##### **Para-clinical**

- ii) Many of the procedural skills presently tested in the university examinations of paraclinical departments are not fully relevant to the needs of future medical practice.
- iii) The tasks given in the practical examinations of pre and para-clinical disciplines should be of uniform difficulty as far as possible.

iv. In many universities, during the practical examination, the procedure is not performed in front of the examiner. Under the present system, it may not even be possible for the examiners to simultaneously observe procedures of all the candidates and award marks. Only the end result is given most of the credit. In order to overcome these shortcomings, Objective Structured Practical Examination (OSPE) method may be followed. Accordingly the marks allotted for the practical examination may be divided into:

- a) Procedure
- b) End result
- c) Interpretation and discussion

For all quantitative experiments,  $\pm 10$  percent variability in the end result of an experiment or a laboratory test may be permitted.

Such a scheme would reduce the element of chance or examination anxiety interfering with procedure or end result. It would also take into account the cognitive ability of interpretation of laboratory results which in fact is as important if not more than mechanical performance of the procedure.

v. The emphasis should shift from mere performance of certain procedures, for example, staining of a slide or quantitative analysis of a blood sample for electrolytes to interpretation of the findings.

vi. Atleast 25 per cent of total marks for practical examination in every subject must be allotted to internal assessment. This 25 per cent may be further subdivided as 20 per cent for laboratory exercises, experiments, field visits, etc. and five per cent for records.

vii. The marks obtained in the internal assessment for practical should be added in the university examination to marks allocated to practical examination, and counted for pass or fail.

viii. The minimum marks for practicals in the university examination to pass a subject must be 50 per cent of total marks allotted for practical examination.

## 5. CLINICAL EXAMINATION :

The groups felt that the time available now to the students in the university clinical examination i.e, long and short cases and bed side viva voce is not adequate. Therefore, 60 minutes for a long case and 20 minutes for a short case may be given for each student. The present practice of holding viva voce in the afternoons may be stopped. The clinical skills assessment of students and viva voce may be merged and conducted at the bed side.

There is no uniform distribution of time spent in examining the candidates during the university examinations. It is 'too long' for the candidates at the beginning of the session and too short' for the candidates appearing towards the end. Therefore, some minimum time, say atleast 10 minutes, must be spent for examining each candidate. Not more than 20 candidates should be examined in a day.

The emphasis should shift from asking about diagnosis to testing clinical examination skills and clinical decision making. Different elements of clinical skills may be structured and differential weightage given as :

Particulars	Percentage of marks to total for the case
* Eliciting history	15
* Physical examination and interpretation of finding	25
* Selection of investigations	10
* Diagnosis and discussion of differential diagnosis	10
* Management	30
* Counselling / prognosis and communication	10

The chance element in the type of case a student gets in the examination, the subjectivity in the marking by different examiners (the 'hawks' and the 'doves') may be overcome by adopting **Objective Structured Clinical Examination (OSCE)** both for internal assessment and for the university examinations. This will also ensure similar abilities tested in all students.

The weightage for internal assessment should be increased from the existing 6-10 per cent to atleast 25 per cen immediately and progressively, in phases upto 50 per cent.

The marks obtained in internal assessment must be added to the marks for the clinical examination component of the university examination.

The minimum pass marks of 50 per cent for clinical examination fixed now is arbitrary but acceptable till OSCE is introduced in the university examinations.

## 6. INTERNSHIP (Compulsory rotatory housemanship)

- \* The internship training should be formalised and structured.
- \* Interns should get adequate training in "MUST DO" or Essential Skills (listed in the Medical Council of India revised recommendations. 1993).
- \* Their work and progress must be mentioned through mechanisms such as logbook or diary.
- \* Competency based evaluation should be adopted to ensure core competency among all interns.

## 7. GENERAL

- i) Remuneration for the examiners should be enhanced to attract competent examiners for both setting papers and to conduct university practical/clinical examinations.

- ii) A systems-audit to assess the current evaluation methods should be done particularly to estimate their validity and reliability. This would help in providing corrective feedback.
- iii) There is limited or no assessment of non-cognitive areas: clinical decision making skills, communication skills, self-directed learning skills and ethical decision making skills. 'Standarised patients', role-play, simulation and other innovative methods of student assessment for the above areas should be developed.
- iv) Major advances in the technology of clinical competence assessment have been made using standardised (simulated) patients in the US an the UK. There is need to review findings of these advances and adopt them appropriately.
- v) Award of grace marks should be restricted to the minimum and in any case should not exceed one per cent (1 %) of total marks in one subject only.

## 8. INNOVATIONS :

The group considered all the recommendations of the earlier sessions and identified innovations that can be attempted in the near future.

### I. Periodic and Class Room Test :

1. Record writing has become a mere ritual now. Log book(s) with innovative ideas for regularly monitoring and documenting student's progress may be developed.
2. Instead of awarding marks presently in the scale of 0 to 100 in the class tests, a grading system may be adopted on a five point scale (Excellent - Very good - Good - Fair - Poor).
3. The use of objective structured examinations especially for practical and clinical assessment (OSPE and OSCE)

may be introduced. This would also help in providing corrective feedback of learning.

4. Certain important abilities and skills such as practical procedures, communication skills, ethical decision making skills etc., are generally not tested in the university examinations. Evaluation instruments such as observation sheets, check-lists etc., for assessment of the above abilities may be developed.

## II) The (final) University Examinations

5. For theory examinations,
  - 5.1 Topics/chapters/systems in each subject may be divided into segments and proportional weightage given by consensus.
  - 5.2 A table of specifications (Blue print) may be prepared to balance the question paper. This would improve content sampling.
  - 5.3 Both long and short essay questions may be structured.
  - 5.4 Some very brief answer type of questions (supply-type) may be included. That would help to improve objectivity. Not more than 25 per cent weightage be given to the supply type of questions in a paper.
6. External paper setters should be supplied by the universities with an outline of syllabus, question paper guidelines, specification table and model questions.
7. The paper setters should submit to the universities, along with question papers the completed specification tables and model answers. For long essay type of questions,

atleast a brief outline of the expected answers or elements of the answers should be supplied.

8. Editing and moderation of the question papers should be done before they are finalised and printed.
9. Wherever four examiners are appointed, the paper may be divided into four sections, for example, Section A, B, C and D. Students may be asked to answer the four sections in separate answer books. Each examiner may value one section of the answer scripts of all the students. This would be a step towards improving the objectivity of scores.

Wherever multiple choice type of questions (MCQ) are included in the theory paper, a minimum of 100 MCQs must be asked with separate pass marks fixed for them. The conventional pass marks of 40 per cent or 50 per cent cannot be applied to MCQ papers.

10. Integrated clinically oriented question papers containing questions on Anatomy, Physiology and Biochemistry for pre-clinical students have been attempted successfully at Seth G.S. Medical College, Bombay. This may be tried in other medical schools and extended to paraclinical subjects also.
11. Question Banks should be created after performing item analysis. Initially the bank may be 'close type'. A closed type of question would contain atleast a minimum of five questions (item) on a task of similar difficulty level. As and when the number of questions are large enough (i.e atleast 20 questions on a task), they may be made open type. To start with, question banks may be instituted college wise and progressively regional and national level banks may be developed.

**12. For clinical examination :**

- 12.1 Internal assessment of clinical skills should consist of regular, periodic objective and transparent evaluation. Skills not tested in final examination should be assessed.
- 12.2 Send up (Mock) examination may be treated differently than other examinations and should carry less weightage for IA.
- 12.3 Grading system (5-point) may be adopted to assess component skills. If needed, these may be converted to numerical scores.
- 12.4 Adopt objective structured examination in a progressive manner using standardised patients.
- 12.5 Merge viva voce examination with clinical examination to assess interpretative, decision making and other higher cognitive skills.

**13. For oral examinations -**

- 13.1 To improve the oral examinations in future, review and critic of questions asked in oral examination was recommended either by noting the questions or by recording them using an audio tape or a video recorder.
- 13.2 Written problems, materials such as X-ray, ECG recording, laboratory reports, pathology specimens, etc. should be classified and questions related to them should be stored in a system of cards. Examiners should score independently according to predetermined scheme and the average score should be taken.

# ASSESSMENT OF THEORECTICAL TEACHING

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*"Perfect happiness for the student and teacher will come with the abolition of examinations which are stumbling blocks in the pathway of the true student".*

- Sir. William Osler

Inspite of Osler's statement, Assessment forms the nucleus of our educational system. Students learn just to pass the examination and the teachers are often willing to oblige.

Examinations are also necessary to select a candidate for admission to any course or for employment.

Therefore the quality of Assessment is as important as teaching in educational network.

## A. Types of Assessment/evaluation :

1. Diagnostic assessment : Ideal for selection of a candidate before course or placement. The objective is to find suitability and proficiency of a person.
2. Formative assessment : Ideal during the course. Its purpose is to provide feedback to the student and teacher. Its result may form a part of the internal assessment. MCI recommends 50% score for internal assessments of the final examination.
3. Summative assessment : This is the final assessment at the end of a phase, or an entire course. It helps to award ranks, medals and grades.

## B. Modes of Assessment : There are many methods to test the theoretical knowledge of the students but each one should fulfill the following criteria which guide the choice of the

method used to assess. These are :

- i) Reliability - This refers to the reproducibility of the results obtained. It should give the same measurement of the same thing on different occasions even when the questions are changed or when the examiners are different.
- ii) Validity : This refers to what the test really measures and what one wishes to measure. A score of 8/10 for a question on cardiac output does not predict the students competence in managing a patient of cardiac failure in future. Nor a student who writes the correct steps of laprotomy a suitable and successful surgeon in later years.
- iii) Feasibility : This refers to see whether the time involved in developing, instituting, scoring and reporting a test is justified.
- iv) The test should be stimulating and compelling the students to learn with understanding the whole course without selective study.

- 1) Criterion - referenced assessment : This is a measure of how well a student does in relation to some predetermined criteria. The criteria might have been established empirically or rationally e.g. student should know 6/10 contents of knowledge to be declared as successful.
- 2) Norm - referenced assessment : This is in a measure of the performance of some standard group or whole batch of students. If most of the students are scoring 50% of marks, then those who score less than 50% fail. Obviously a poor way of assessment.

"How can you possibly award prizes when everybody missed the target?" said Alice. 'Well" said the Queen, "some missed by more than others and we have a fine normal distribution of misses which means we can forget about the target".

Lewis Carroll in Alice in Wonderland

## ORAL EXAMINATION

### Advantages :

- 1) Direct personal contact with the candidate.
- 2) Flexibility to move from strong to weak areas and vice versa.
- 3) Opportunity to question the student on how he has arrived at the answer.
- 4) Permits examiner to give hints to elicit desired responses. Memory block can be cleared.
- 5) Opportunity for discussion.
- 6) If properly designed and conducted, a wide coverage of the subject areas is possible.

### Disadvantages :

- 1) Inadequate standardisation
- 2) Insufficient objectivity and reproducibility of results.
- 3) Emotional state of the candidates, viz. anxiety, tension, apprehension etc.
- 4) Undue influence of irrelevant factors.
- 5) Want of planning leads to poor quality of questions.
- 6) Poor sampling, occurs if time available is short.

### GUIDELINES FOR IMPROVING VIVA VOCE

- A) Reduce the candidate's anxiety and tension:
  - 1) Put the students at ease before the viva begins
  - 2) Give an "oral card" containing a problem while he waits for his turn.
- B) Plan and ask questions to make the test as objective, reliable and valid as possible.

- 1) Start with a simple question.
- 2) Raise the standard of questions gradually to a level which is considered as " Minimum acceptable competence".  
(Concentrate on basic and common items required for his future tasks)
- 3) Questions should cover a wide area to ensure proper sampling.
- 4) Include some questions which would test his understanding/comprehension of the subject matter and his ability to apply it to problem situations.
- 5) Decide before hand, the number and nature of questions, and also the expected answers and their marks.
- 6) Once the candidate has satisfied the minimum requirements for a pass by answering questions in the "essential area", test him at a higher level ("nice-to-know" variety) to give higher grades.
- 7) Develop a checklist of questions that the examiner must ask for each candidate.

**C) Examiner behaviour :**

- 1) Be helpful and friendly throughout the testing period.
- 2) When the student gives correct answers to your questions, reward him by appropriate words or gestures.
- 3) If the student does not answer a question, alter the wording. Give him clues if necessary.
- 4) When he makes a blunder, never make fun of him.
- 5) Do not persist with the same content area if the candidate is obviously ignorant. Change the subject.

- 6) When the candidate gives an answer with which you do not agree, do not bluntly contradict him. Ask for reasons. Give credit to views expressed in standard books, journals and by other experts.
- 7) Do not interrupt a candidate unnecessarily.
- 8) Do not attempt to teach
- 9) At the close of the examination, send him out with a polite remark.

**D) Common errors of examiners during orals :**

- 1) Leniency
- 2) Central tendency
- 3) Halo effect
- 4) Proximity errors

### **ORAL CARD**

A man aged 60 years was admitted to the hospital in an unconscious state. On examination, he had pin point pupils, respiratory depression, coma and puncture marks. His blood pressure was 70/40 mm of Hg and body temperature was 34 degree celsius.

#### **QUESTIONS :**

- 1) What is the most probable diagnosis?
- 2) Which urine test will you perform to confirm the diagnosis?
- 3) What immediate steps you would like to take to revive the patient.
- 4) Which is the antidote?
- 5) What are the hazards of using the antidote? How will you prevent it?
- 6) Which other drugs can produce same type of symptoms

THE 1948 British Medical Association report recorded an admirable list of recipes for examiners which had been provided by one of its witnesses.

- 1) Treat the candidate with that courtesy which is his due.
- 2) Do not flatly contradict any candidate.
- 3) Try to find out what the candidate knows. If you find a serious lacuna in his knowledge, there is no need to plumb to its depth, change the subject.
- 4) Be prepared to receive views with which you may not agree so long as they are accepted by teachers of repute.
- 5) Put your question clearly. If the candidate does not answer, it may be because he did not understand what you were driving at. Do not wait (As has been known) for fifteen or thirty seconds, before altering the wording of the question.
- 6) Be careful how you joke with examinees. they are not always in the mood for seeing a joke especially when it may be against themselves.

# OBJECTIVE TESTS

Objective tests are tests which can be scored without any bias, where the scoring is consistent. The marks obtained will be the same no matter who corrects the paper. That is why it is called objective (as opposed to subjective) test.

## OBJECTIVE TESTS

<u>Supply type</u>	<u>Selection type</u>		
*Short answer type	* Multiple choice question	* Matching (B type)	* Assertion - Reason type
* Completion type	A type K type X type		

### I) Supply Type

A) Example of short answer item: Where is Belgaum located? (Bad example because there are many correct answers : India, South India, Karnataka, on a hillock etc!) The unambiguous way of writing this question is : In which state of India is Belgaum located? There can only be one answer : KARNATAKA.

### B) Example of completion type item :

The aforesaid example could be asked as a completion item.

Belgaum is located in \_\_\_\_\_  
(Bad example again because here blank could be filled by many "correct" responses).

The unambiguous way of writing this item is  
The name of the state of India in which Belgaum is located is \_\_\_\_\_.

Short answer and completion types are useful to measure simple learning outcomes like :

- \* Knowledge of specific facts
- \* Knowledge of principles
- \* Knowledge of method or procedure
- \* In the field of mathematics and science, problem solving can be tested
- \* Ability to solve numerical problems
- \* Skill in manipulating mathematical symbols

## CHECKLIST FOR REVIEWING SUPPLY-TYPE ITEMS

### REVIEW QUESTIONS :

	YES	NO
1) Is this the most appropriate type of item to use for the intended learning outcomes ?	_____	_____
2) Can the items be answered with a number, symbol, word, or phrase ?	_____	_____
3) Has textbook language been avoided ?	_____	_____
4) Have the items been stated so that only one response is correct ?	_____	_____
5) Are all the answer blanks equal in length ?	_____	_____
6) Are the answer blanks at the end of the items ?	_____	_____
7) Are the items free of clues (such as a or an)?	_____	_____
8) Has the degree of precision been indicated for numerical answers ?	_____	_____
9) Have the units been indicated when numerical answers are expressed in units ?	_____	_____

	YES	NO
10) Have the items been phrased so as to minimize spelling errors?	_____	_____
11) Have the items been set aside for a time before reviewing them?	_____	_____
12) If revised, are the items still relevant to the intended learning outcomes ?	_____	_____

### THE MULTIPLE CHOICE QUESTION

The Multiple Choice Question (MCQ) is an incomplete statement followed by 4 or 5 possible completions of the statement. The MCQ can also be written as a question followed by 4 or 5 possible answers to the question.

The statement or question part is called the STEM. The possible completions or answers are called RESPONSES or FOILS. The RESPONSES (or FOILS) are divided into the KEYED ANSWER (correct or best response) and the DISTRACTORS (incorrect or non-best responses).

\* The medical speciality that deals STEM —

with mental illness is called

A. Cardiology

B. Dermatology

C. Microbiology

D. Orthopaedics

E. Psychiatry

DISTRACTORS

RESPONSES

ITEM

OR FOILS

KEYED ANSWER

**The Single best response type MCQ**

**Directions :** Encircle the alphabet corresponding to the single best response

- 1) In which state of India is Belgaum situated ?
  - A. Andhra Pradesh
  - B. Bihar
  - C. Karnataka
  - D. Kerala
  - E. Orissa
  
2. J.N. Medical College is affiliated to the University of :
  - A. Bangalore
  - B. Gulbarba
  - C. Karnataka
  - D. Mangalore
  - E. Kuvempu

**GUIDELINES FOR FRAMING MCQs OF SINGLE BEST RESPONSE TYPE (A TYPE)**

Guidelines for use of the format of the MCQ :

- 1) The instructions for answering must be very clear.
  
- 2) The item should be written in conformity with the standard format, for example the responses should be preceded by CAPITAL LETTERS : A,B,C,D,E.

**Guidelines for writing the stem :**

- 3) The stem should present a single clearly formulated problem and be stated as a question or an incomplete statement.
  
- 4) The stem should contain as much of the wording as possible.
  
- 5) Extraneous material (window dressing) in the stem should be avoided.

6) Negatives should be avoided unless the negative information is of particular importance, and, when used the negative aspect should be emphasized.

### **GUIDELINES FOR WRITING THE RESPONSES :**

7) The keyed answer should be correct or clearly the best.

8) Clues to the keyed answer (or away from it) such as the following should be avoided :

- Length of response
- grammer in relation to the stem
- verbal clues
- non-random or illogically placed responses.

9) "All of the above" should be used with discretion.

10) "None of the above" is best used when it is specifically important to include or exclude each of the other responses.

### **CHECKLIST FOR REVIEWING MULTIPLE-CHOICE ITEMS**

**(Single Best Response or A type)**

<b>Review Questions</b>	<b>YES</b>	<b>NO</b>
1) Is this the most appropriate type of items to use?	_____	_____
2) Does each item stem present a meaningful problem?	_____	_____
3) Are the item stems free of irrelevant material?	_____	_____
4) Are the item stems stated in positive terms (if possible) ?	_____	_____
5) If used, has negative wording been given special emphasis (e.g. capitalised) ?	_____	_____

**Review Questions**

**YES**

**NO**

6) Are the alternatives grammatically consistent with the item stem? \_\_\_\_\_

7) Are the alternative answers brief and free of unnecessary words? \_\_\_\_\_

8) Are the alternatives similar in length and form ? \_\_\_\_\_

9) Is there only one correct or clearly best answer? \_\_\_\_\_

10) Are the distractors plausible to nonachievers ? \_\_\_\_\_

11) Are the items free of verbal clues to answer ? \_\_\_\_\_

12) Are the alternatives in alphabetical order ? \_\_\_\_\_

13) Are numerical alternatives in numerical order ? \_\_\_\_\_

14) Have "none of the above" and "all of the above" been avoided (or used sparingly and appropriately)? \_\_\_\_\_

15) If revised, are the items still relevant to the intended learning outcomes ? \_\_\_\_\_

16) Have the items been set aside for a time before reviewing them ? \_\_\_\_\_

## THE MULTIPLE CORRECT RESPONSE TYPE MCQ (K type)

**DIRECTIONS:** Each question below contains four suggested answers of which one, more than one or all can be correct.

### ENCIRCLE :

- A. If 1,2 and 3 are correct
- B. If 1 and 3 are correct
- C. If 2 and 4 are correct
- D. If 4 alone is correct
- E. If 1,2,3, and 4 are correct

\* J.N. Medical college has a branch of which of the following banks ?

- 1. Canara
- 2. Corporation
- 3. Vijaya
- 4. Syndicate

\* The subject(s) taught to the I MBBS students is/are

- 1. Anatomy
- 2. Biochemistry
- 3. Physiology
- 4. Pharmacology

## GUIDELINES FOR FRAMING MCQs OF K TYPE

- 1) The instructions must be very clear (Each page should have the guidelines on the top).
- 2) The item should be written in conformity with the standard format.
- 3) The stem is often a word or a group of words which need not present a clearly formulated problem.
- 4) The stem should contain as much of the wording as possible.

- 5) Avoid window dressing.
- 6) Negatives should be avoided if possible.
- 7) The 'Key' (combination of correct responses) should be clearly the best.
- 8) Avoid opposites in responses.
- 9) "All of the above" must be avoided.
- 10) "None of the above" must be avoided.

### **MULTIPLE TRUE/FALSE TYPE (X Type)**

**Directions :** Each question consists of a stem followed by five responses. Indicate whether each response is True (T), False (F) or Don't know (DK) by circling the appropriate letter.

Please note the marking :      Correct answer : + 1  
                                    Incorrect answer : - 1  
                                    Don't know response : 0

#### ***Example 1 :***

Belgaum has a

A. Race Course	T ( )	F( )	DK ( )
B. Nursery school	T ( )	F( )	DK ( )
C. Medical college	T ( )	F( )	DK ( )
D. Public Library	T ( )	F( )	DK ( )
E. Number of hotels	T ( )	F( )	DK ( )

#### ***Example 2 :***

Rajiv Gandhi is

A. the son of Indira Gandhi	T ( )	F( )	DK ( )
B. the present Prime Minister	T ( )	F( )	DK ( )
C. the founder of Congress (I)	T ( )	F( )	DK ( )
D. a member of Lok Sabha	T ( )	F( )	DK ( )
E. a former pilot	T ( )	F( )	DK ( )

**Example 3 :**

Which of the following cricketers have scored more than 6000 runs in test cricket ?

A. Viv Richards	T ( )	F( )	DK ( )
B. Clive Lloyd	T ( )	F( )	DK ( )
C. Sunil Gavaskar	T ( )	F( )	DK ( )
D. Javed Miandad	T ( )	F( )	DK ( )
E. Alan Border	T ( )	F( )	DK ( )

Guidelines for framing MCQ of X Type :

- 1) Same as A/K Type MCQ
- 2) Same as A/K Type MCQ
- 3) Same for K type MCQ. The stem is often a word or a group of words which need not present a clearly formulated problem.
- 4) Same as A/K type MCQ
- 5) Same as A/K type MCQ
- 6) Negative should be avoided, wherever possible.
- 7) The key should be clearly the best
- 8) a) Avoid opposites in responses  
 b) Avoid giving verbal clues  
 c) Avoid giving in the stem how many of the responses are correct  
 d) Avoid use of words like always, never, invariably.  
 e) Avoid double negatives
- 9) Same as A/K type MCQ
- 10) Same as A/K type MCQ.

## CHECKLIST FOR REVIEWING MULTIPLE TRUE FALSE ITEMS (MCQ - X TABLE TYPE)

Review questions	YES	NO
1) Is this the most appropriate type of item to use ?		
2) Can each statement be clearly judged true or false?		
3) Have specific determiners (e.g. usually, always) been avoided?		
4) Have trivial statements been avoided?		
5) Have negative statements (especially double negatives) been avoided?		
6) Have the items been stated in simple, clear language?		
7) Are opinion statements (if given) attributed to some source?		
8) Are the true and false items approximately equal in length?		
9) Has a detectable pattern of answers (e.g. T,FT,F) been avoided?		
10) Have the items been set aside for a time before reviewing them ?		
11) If revised, are the items still relevant to the intended learning outcomes ?		
12) Have you provided 3 options True, False, Don't know and informed the students that Don't know answers attract 0 marks while wrong answers attract negative marks/		

## MATCHING (BType)

### INSTRUCTION :

A list of lettered items is followed by a list of numbered items. For each NUMBERED ITEM choose the appropriate LETTERED ITEM and put your response in the space provided. The lettered items may be chosen once, more than once or not at all.

### Example - I :

For each POLITICAL PERSONALITY (Number items) choose the COUNTRY (lettered items) to which he/she belongs.

- A. China
- B. Bangladesh
- C. India
- D. Iraq
- E. South Africa

1) Saddam Hussein	( )
2) Bill Clinton	( )
3) John Major	( )

### Example - II :

For each CITY (numbered items) match the appropriate STATE OF INDIA (lettered items) in which the city is located.

A. Andhra Pradesh	1. Hyderabad ( )
B. Karnataka	2. Belgaum ( )
C. Kerala	3. Bangalore ( )
D. Maharashtra	
E. Tamilnadu	

The items for which a match is sought are called premises. The items from which the selection is made are called responses. In the above examples selection is made from A,B,C,D,E. So these are responses. Premises are the numbered items.

**CHECKLIST FOR REVIEWING MATCHING ITEMS****REVIEW QUESTIONS**      **YES**      **NO**

1. Is this the most appropriate type of item to use? \_\_\_\_\_
2. Is the material in the two list homogeneous? \_\_\_\_\_
3. Is the list of responses longer or shorter than the list of premises? \_\_\_\_\_
4. Are the responses brief? \_\_\_\_\_
5. Have the responses been placed in alphabetical or numerical order? \_\_\_\_\_
6. Do the directions indicate the basis for matching? \_\_\_\_\_
7. Do the directions indicate that each response may be used more than once? \_\_\_\_\_
- 8) Are all the premises and responses on the same page? \_\_\_\_\_
- 9) If reviewed, are the items still relevant to the intended learning outcomes? \_\_\_\_\_
- 10) Have the items been set aside for a time before reviewing them? \_\_\_\_\_

## ASSERTION / REASON TYPE

In the Assertion / Reason type, two statements are given, the first statement being in the form of an assertion while the following is in the form of a reason. As a response, the item relating the assertion with the reason is to be indicated. The key usually is :

Use    A if the assertion is true, reason is true and reason is a correct explanation of the assertion,

      B if assertion is true, reason is true but the reason is not the correct explanation of the assertion.

      C if the assertion is true but reason is wrong.

      D if assertion is wrong but reason is true,

      E if both assertion and reason are wrong.

### SAMPLE ITEM :

In lepromatous leprosy, infection is widespread and bacilli are numerous in all lesions,

### BECAUSE

of the cell mediated immunity which leads to high Titre of antibody and positive lepromin test

Key : C

### Points to remember :

- 1) This type of question is suitable for the areas and aspects of content relating to cause and effect of a disease, physiopathological, aspects of a symptom or sign or mechanism of a drug action.
- 2) The central problem should be stated clearly and precisely. The validity of statement (whether right or wrong) is to

be presented in a manner that a candidate is offered a challenge in making a choice.

- 3) Reason should relate to the main point in the statement. There should be parallel options. In this construction, a statement by itself may be true but does not satisfy the requirements of the problem.
- 4) Incorporate a carefully worded incorrect statement that may sound plausible to the uninformed. Common misconceptions or statements which by themselves may be correct but do not provide appropriate explanation for this validity should be constructed.
- 5) Construction should avoid double negatives. Inadvertent clues in grammatical sequence or lengthy sentences, connoting right answers, should be avoided.

#### HOW AND FOR WHAT WILL YOU TEST YOUR STUDENTS

Type of Test item/question	Objectives tested
* Essay Type	Ability to organise, and express ideas. Ability to integrate ideas in global attack on a problem. Ability to write an original response. Ability to evaluate the worth of ideas Ability to analyse Ability to argue logically
*MCQ:Single Best Response Type - (A type)	Recall:Where a number of responses are correct and one is clearly the best
* MCQ:Multiple Correct Response type (K type)	When a group of correct responses must be known - as in syndromes

Type of Test item/question	Objectives tested
* MCQ:Multiple True/False Type (X Type)	When a number of aspects about a particular topic are to be asked
* Short answer question / completion item	Recall Problem solving Manipulation of symbols Balancing of equations Recall of facts where supply is important
* Interpretive exercise	Ability to interpret data and solve problems

**Please Remember :**

1. Choose the type of test item/question depending on what you expect your students to do. Match the test item type to the learning outcome.
2. An ideal question paper should have a mixture of all question types.

**HOW TO WRITE A GOOD M.C.Q. - SOME TIPS**

A) Plan the question :

- i) Is it testing important and useful aspect
- ii) It should test a single aspect of knowledge.
- iii) Decide on the ability of the student to be tested.
- iv) Decide on the manner of presentation of data.

B. Write the question

- i) Use simple and clear language
- ii) Write the stem as a possible question, if possible
- iii) The stem, read with each alternative, should read as a complete statement.
- iv) Keep the reading time of the question to the minimum.
- v) Make the responses as clear as possible.

- vi) Avoid clues to the correct answer e.g.
  - a) Stereotyped phrases
  - b) Grossly unequal length of alternatives.
  - c) Inconsistencies between stem and alternatives
  - d) Use of opposites as distractors
  - e) Use of absolutes like 'always', 'only', 'never' etc.
  - f) Use of synonyms or overlapping objectives.
  - g) Use of a distractor so different from the others that it STANDS OUT.
- vii) Distractors should be plausible and logical.
- viii) Avoid abbreviations
- ix) Specify units precisely.
- x) Be careful with negatives. Do not use double negatives.
- xi) Avoid terms like "all of the above" or "none of the above". Do not use them together in the same question.

C. Test the question

- i) Prevalidation
- ii) Post validation

"The MCQ is currently suffering from the effect of much uninformed enthusiasm. Unfortunately, many bad MCQ tests are now in use, mostly written and prepared by people with no knowledge of what is necessarily involved. Many of the writers of such questions and tests know nothing more of the genre than they may have gained from seeing a few other MCQ tests or perhaps having once taken part in such a test. To ask such people to construct a meaningful test is rather like expecting one's typist to be able to build a bus, because she's ridden in one".

*Simpson*

We must, all of us, if we act as examiners occasionally be driven to fail a candidate. Since it is to be assumed that we do not do it for pleasure, if we are to satisfy our consciences we must ensure that **NOTHING BUT HIS IGNORANCE OF THE SUBJECT** stands between a candidate and A PASS MARK. We ought not to indulge ourselves in overcomplex mcq formats which act as an irrelevant barrier. Simple format, precisely though-out wording and collaboration in authorship are the chief ingredients of success in this field.

## MULTIPAL CHOICE QUESTIONS EVALUATION\*

**Dr. Kusum Verma**

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New Delhi

The aim of evaluation is to assess student achievements as well as the efficacy of the teaching programme. The assessment should be able to classify students into categories of bright, passable (or acceptable) and below standard. It should serve as a feedback to both teachers and students indicating areas of strength or weakness.

Scoring in multiple choice questions (MCQs) is not simple and involves many complex issues. Different methods are applicable to different types of MCQs. However, the correct answers are predetermined and a candidate gets the same marks at the hands of all examiners for a given question. In that respect, marking of MCQs is considered simpler as well as more objective than marking of essay type or short answer questions.

### ANSWER SHEETS

Students can be asked to mark their responses either on the question paper itself or on separate answer sheets provided for this purpose. Separate answer sheets are advisable when MCQs are used for large group of students. They increase the speed and accuracy of scoring and also facilitate the study and analysis of responses to individual items ( item analysis).

(\*Reproduced from : Assessment in Medical Education, Trends and Tools; K. L. Wig Centre for Medical Education Technology ; AIIMS, New Delhi)

## PROCESSING OF ANSWER SHEETS

Scoring may be done manually or by the use of scoring machines or computers. Manual scoring can be done by non-professional persons. Before scoring is started, certain procedures must be followed. Stray marks should be erased or identified. If double marks are found instead of single one, then all credit should be denied to that answer. Questions left blank or unanswered may be crossed out. It is advisable to have a second person independently check the scoring.

## MAKING OF QUESTIONS

The general principle followed is that a student should get credit for a correct selection of a positive response or correct non-selection of a negative response.

There is an element of guessing in answering of MCQs. The results of MCQ examination should indicate only candidate's knowledge of the content of the paper and he should not gain any advantage by marking questions at random, by marking all answers as true or by marking all answers as false. The question of applying guessing correction in the form of negative marking is discussed subsequently.

### Single best response type

These types of MCQs have been used maximally by American Boards and various entrance Examinations in India. American Boards recommend + 1 for each item correctly marked and no negative marks for wrong answers. Element of guessing in these types of questions varies with the number of items. When there are 5 responses in a question, there is a 20 per cent chance that a student may get the right answer by guessing. This chance increases to 25 per cent if a question has 4 responses to it.

Many authorities recommend negative marking for wrong answers to discourage guessing. It is recommended that for each

wrong selection, mark deducted is  $1/n-1$ , where 'n' is the number of choice items. It would be -  $1/4$  for a question with 5 items and -  $1/3$  for one with 4 items.

It is believed that the effect of guessing is negligible in a well constructed 200 question test of 5 responses. It is estimated that only 1 in 1000 student would score as high as 29 per cent by guessing alone. If sufficient time is provided and candidates are asked to respond to all question, then no change in ranking of students occurs whether guessing correction is applied or not. This is illustrated in the following example where no change in ranking occurs although scores are reduced.

**Table 1. Effect of applying correction by negative marking to scores in an MCQ test**

Question paper -100 questions : single best response with 4 foils each.

Student	No. ques. right	No. ques. wrong	Score without correction	Score after correction
A.	100	0	100	100
B.	70	30	70	60
C.	61	39	61	48
D.	58	42	58	44
E.	43	57	43	24

It is thus felt that where only ranking of students is desired (as in entrance Examinations), guessing correction may not be applied. However, if MCQs are being used for formative or summative assessment of students, guessing correction would have to be applied, as in our university system scores are used for determining pass or fail. It is essential that clear instructions are provided to the examinees whether negative marking will be used or not in a particular paper.

## Multiple response type

Marking of these questions may be done by either of the following two methods.

### Method 1 :

Students are asked to mark their selection to true alternatives only on the question paper or answer sheet. They leave blank the alternatives which they consider as false ; or on which they do not wish to give an opinion. In such a system there is not way of distinguishing between students 'who do not know' and students who know that the item is 'false'

Candidate is given + 1 score for each correct selection and - 1 for each incorrect selection. For items left blank, no credit or discredit is given.

Final score	$A \times 100$	$B \times 100$
or	= -----	- -----
% marks	T	F

where A	- No. of items marked correctly
B	- No. of items marked incorrectly
T	- Total correct items
F	- Total incorrect items

In such a paper, number of true alternatives should roughly be equal to the number of false alternatives.

### Method 2

In this method, the candidates indicate against each item whether it is true, false, or 'do not know'. He gets + 1 for each item correctly scored, whether positive or negative - 1 is deducted for each item incorrectly answered and 0 for items answered as 'do not know'. By the second method of marking, one is able to distinguish good students from the average ones. This is illustrated in the following example (table 2.)

By method 2 of marking, one is able to differentiate that student A is better than student B, although by method 1 both scored the same marks.

**Table 2.** Multiple response type question scoring by two systems

Question with 5 items : 3 correct, 2 false

<i>Method 1</i>	<i>Method 2</i>
<b>Students A &amp; B</b>	<b>Student A</b>
* Marked true : 2 correct, 1 incorrect	* Marked true : 2 correct 1 incorrect
* Left blank 2	* Marked false : 1 correct * Do not know : 1
<b>Score : 2-1+0=1</b>	<b>Score : 2-1+1+0 = 2</b>
	<b>Student B</b>
	* Marked true : 2 correct 1 incorrect
	* Marked false : None * Do not know : 2
	<b>Score : 2-1+0+0 = 2</b>

Multiple completion type :

Marking is like that of single response questions. It may be noted that only a student having complete knowledge will get credit. Students having partial and /or wrong knowledge will get negative marks.

Reason assertion type

Scoring is like that of single response questions.

Matching type

Scoring of this type of MCQs is debatable. Various methods available are :

1. + 1 and -1 for each correct and incorrect matching respectively. By this the maximum marks allocated to a question with 5 matching items becomes 5 and thus the question gets weighted.
2. +  $1/n$  and -  $1/n$  for each correct and incorrect matching item respectively ; where  $n$  is the number of matching items in the question. This way the maximum marks allocated to the question would remain as 1 only.

### Weighting of Questions

It is possible to weight question by assigning more marks to those from important course areas which a student must know. However, there is difficulty in reaching agreement among experts on the relative importance of different items of information. Results also show that this differential marking does not add to reliability or validity of the examination. A better method is to add more questions in areas considered to be part of the core curriculum.

### Objective Score Conversion/Setting Pass Marks

In a norm-referenced assessment, there is no need to convert scores obtained after corrections for guessing have been made. These could be used as such or converted into percentile ranking.

However, in India, where the minimum percentage of pass marks are prescribed by universities, scores obtained after guessing corrections cannot be used as equivalent to scores obtained in essay type or short answer questions. Further, many times, MCQs may be part of an examination in a subject and MCQ scores need to be brought in line with scores in essay type or SAQ questions.

There is no universally accepted method for objective score conversion. Various methods recommended are :

1. A committee decides for each paper the minimum number of question or minimum set of questions which must be correctly answered for a candidate to pass. The pass percentage would thus vary from paper to paper.
2. The median of the scores of a group of students is determined and + S. D. added to it, and the pass percentage is then decided.
3. Scaled scores may be determined by drawing graphs. This is possible if the same batch of students is administered MCQ and essay type questions at the same time.

In conclusion, it can be stated that even though marker reliability of MCQ test is 100 per cent, the overall estimated reliability of a test of 'n' number of items depends on the number of items. More the number, greater is the reliability.

### **VALIDATION, ITEM ANALYSIS AND QUESTION BANKING**

A basic question that confronts MCQ test constructors (examiners) and students is how to judge the quality of the test. The criteria generally considered important in answering this question are validity of the test, reliability of the test and item analysis.

It is important to review the test as a whole and also the individual questions to answer the above question.

### **REVIEW OF TEST**

**Adequacy of time involved :** Generally one minute per question is the time allotted in a question paper comprising of MCQs. At times, it is found that this may be less or more than adequate. This would reflect on the performance of students. It is preferable to have a question at the end of the paper asking the students if, the time was adequate or not. If more than 5 per cent of the students comment that the time was inadequate, then this needs to be looked into.

**Number of students attempting each question :** It is also important to determine if any particular question in a given paper is not attempted by more than 5 per cent of the students. There are several reasons for not attempting a particular question. It maybe difficult, ambiguous, confusing, out of syllabus or may be appearing at the end of a long paper. Attempt should be made to determine the cause in each case.

**Average performance of students in the test :** The average mean scores obtained in a question paper with single response questions is 50 to 70 per cent in questions with four options and 45 per cent in questions with five options. The mean scores are lower than these figures with multiple true/false and matching type of questions. If the mean score of a group of students in a particular test is higher or lower than the above average, it could be due to a number of reasons. Some of the reasons for low mean scores include a difficult test, student's level below an expected standard, inadequate time for the test or question paper having a large number of debatable questions. On the other hand, high mean scores would reflect either a very easy test or that the level of the students taking the examination is above the standard.

**Differentiation of students of different ability :** As stated in the earlier part, one purpose of examination is to be able to differentiate between students of different abilities. One indicator of whether a test has achieved this purpose or not is the range of marks or the frequency distributions. However, a better indicator for this purpose is the standard deviation of the mean score. If the standard deviation falls within 10 per cent of maximum possible marks, it indicates that the test was able to achieve the objective of discriminating students of different abilities.

#### REVIEW OF INDIVIDUAL QUESTIONS :

Review of Individual questions is most important. If a paper contains substantial number of bad questions, it would be

reflected in review of the test as a whole. On the other hand, when only a small number of questions are bad, the review of the whole test will not be useful. Hence, individual questions should also be reviewed. Validation of the question includes pre validation, post validation and key validation.

### Pre validation

This exercise is done before the examination. A committee consisting of three or four members, two of whom should be subject experts other than the person who has written the contents and the construction of each question. Only those questions which are found to be appropriate by this committee should be used in an examination.

### Post validation (Item analysis)

This is done after a test has been administered and scored, but before the results are announced. Post validation is also a team effort in which two or three teachers involved in the administration of the test should take part. Several different processes and indices of item quality have been developed (Fig. 1) These include :

1. The difficulty of the item (difficulty index or facility value)
2. The discrimination power of the item (discrimination index)
3. The effectiveness of each alternative (distractor functionality or effectiveness)

#### Difficulty Index :

The difficulty level of a test paper is determined by the difficulty level of the individual questions/items in the paper.

#### *Single response questions*

In the case of single response questions, the difficulty index of a question is equal to the percentage of students who

answered the question right from among those who attempted the question. As can be seen, this index will be higher for questions that are easy and lower for questions that are difficult. For this reason, this index has also been called the 'Facility Index'. When the number of students taking a test is larger than about 50, this index can be conveniently calculated using the performance of only part of the Students instead of all the students. The steps in the calculation of the index are as follows :

1. The answer sheets are arranged in order of the total score in the test from the highest score to the lowest score.
2. The papers of the top 27 per cent (in terms of the 'score') of the students, and the bottom 27 per cent of the students are selected. For convenience, one may choose the highest and lowest quarters of the students by thier score. Where the highest and lowest 27 per cent each exceeds 100, it would be enough to select the highest 100 and lowest 100 papers.
3. The number of students who have responded correctly to each question is counted from the two groups of papers chosen in step (2).
4. The number of students who responded correctly to the question in the two groups is added and expressed as a percentage of the total number of students in the two groups. This gives the 'difficulty index' of each question.

$$\text{Difficulty or facility index} = \frac{H + L}{N} \times 100$$

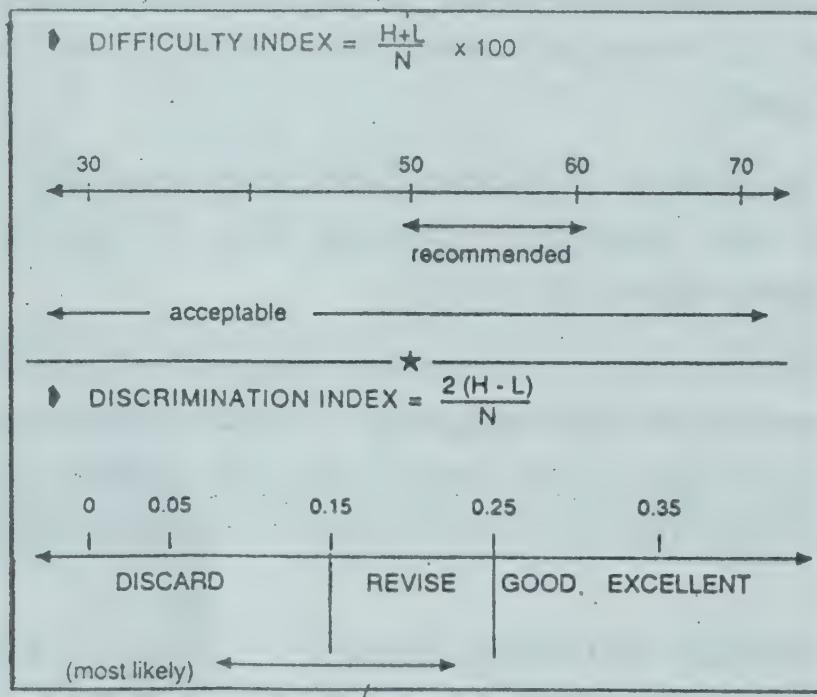
Where H= Number of correct responses in the upper group  
 L= Number of correct responses in the lower group  
 N= Total number of responses in both groups

Ideal difficulty index is between 50 to 60 per cent. Such a test is very likely to be reliable as regards its internal

consistency. Questions with difficulty indices in the range of 30 to 70 per cent are considered satisfactory. It has to be remembered that the difficulty index not only reflects the attributes of a question, but also reflects the ability for the group responding to the question.

### *Multiple response questions (multiple true/false question)*

In the case of multiple true/false question, the difficulty index for the question as a whole is indicated by the mean score for that question. The maximum mark one can get for the multiple true/false question is + 1 and the minimum - 1. If the mean score for a question is greater than '0', it indicates relatively easy question and a mean score of less than '0', it indicates a relatively difficult question. **Mean score in the range - 0.5 to + 0.5 are acceptable.**



### Discrimination Index :

The ability of a question to distinguish between more able and less able students is measured by the 'discrimination index'. The higher the index the more a question will distinguish (for a given group of students) between good and poor students.

There are several discrimination indices in use for the MCQs. All of these indices range from - 1 to +1 and show the discrimination values of questions/items against a specific criterion for a given group. Generally, the criterion (the best estimate of a student's ability at the time of the examination) is taken as his/her score in the whole test. The ability of a single question to reflect a student's performance in a test is directly related to its discrimination value.

### *Single response question*

By using the same method as described for difficulty index, discrimination index is calculated by the following formula:

$$\text{Discrimination index} = \frac{H - L \times 2}{N}$$

Questions with discrimination index of 0.35 and above are considered as excellent, 0.25 to 0.34 as good and 0.2 to 0.24 as acceptable. The questions with discrimination index of less than 0.2 require modification.

The reasons for poor discrimination index would include

- \* too easy or too difficult a question
- \* question not pertaining to the syllabus
- \* confusing wording of the question
- \* having none or more than one correct answer
- \* wrong key

### **Effectiveness of distractors :**

It is essential to examine the distractors in an MCQ for their effectiveness. A distractor is effective if more of the lower ability students pick it (incorrectly) as the correct answer, and less of the Higher ability students pick it as the correct answer. A distractor picked up as correct answer by less than 5 per cent of students is a poor distractor.

### Examples of item analysis

#### Question 1 :

Sanitation barrier means :

- a Segregation of faeces
- b Protection of water supply
- c Control of flies
- d Personal hygiene

Key :a

Question administered to a batch of 20 students

High group - top 6 students

Low group - bottom 6 students

Answers by Students' responses

	a	b	c	d	x <del>Not attempted</del>
High group	4	1	0	1	0
Low group	1	2	1	2	0

$$\text{Difficulty index} = \frac{4+1}{12} \times 100 = 41.6 \text{ (satisfactory)}$$

$$\text{Discrimination index} = \frac{4-1}{12} \times 2 = 0.5 \text{ (good)}$$

Distractor effectiveness - All effective

What are your comments on this question?

**Question 2 :**

**Cholecystokinin**

- a *Stimulates contraction of gall bladder*
- b Stimulates release of bicarbonate rich pancreatic secretion
- c Resemble secretin in its chemical structure
- d Is released predominantly from the gastric antrum

**Key : a**

Question administered to a group of 44 students.

High group - top 14 students

Low group - bottom 14 students

**Answers by students**

	Responses				
	a	b	c	d	Not attempted
High group	14	0	0	0	0
Low group	14	0	0	0	0

$$\text{Difficulty Index} = \frac{14 + 14}{28} \times 100 = 100 \text{ (very easy, not satisfactory)}$$

**14-14**

$$\text{Discrimination index} = \frac{14-14}{28} \times 2 = 0 \text{ (very poor)}$$

**Distractor effectiveness - unsatisfactory**

What are your comments ?

Given below are results of item analysis on some questions with comments.

Q. No.	Difficulty Index	Discrimination Index	Comments
1.	91.5	0.081	Easy with poor discrimination
2.	41.4	0.042	Difficult with poor discrimination
3.	38.1	0.327	Difficult with good discrimination
4.	73.8	0.238	Good question

It is preferable to have question like (3) and (4) rather than (1) and (2) in a question paper.

We should generally choose items at the 50 per cent levels of difficulty and those with highest discriminating power. Sometimes doubt arises whether items with high difficulty index should be retained for further use or not. In such cases, if the item provides a positive index of discrimination and if all the distractors are functioning effectively and if the item measures an educationally significant outcome, it should be retained for further use. Easy questions with high facility index may be retained if it concerns an important topic which a student must know. However, there should be minimum of such questions in paper.

## Key Validation

This has to be done when new questions, not pretested, are used in a question paper. After correction of the paper, random sample papers are selected and item analyses done for the new questions. If the item analysis shows that some of these new questions are bad in terms of having a very high facility index or poor discrimination index or ineffectiveness of distractors, then these questions need to be excluded for the purpose of final evaluation.

## Advantages of item analysis

Item analysis has several benefits :

1. It aids in detecting specific technical flaws and thus provides information for improving text items.
2. It provides useful information during feedback session with students. For example, easy items can be skipped over or treated lightly, answers to difficult items can be explained more fully and defective items can be pointed out to students rather than defended as fair.
3. It provides data for helping the students to improve their learning. The frequency with which an incorrect answer is chosen reveals common errors and misconceptions which provide a focus for remedial work.
4. It provides insight to record the item analysis data on a card and maintain it in the item file. Each time, an item is used in the question paper, it is useful to do an item analysis and record the results on the item card (Fig. 2).

## QUESTION BANK

Considering the efforts involved in preparing good MCQs, it is preferable and economical to maintain a question bank for MCQs. Good questions should be retained and reused, thus improving the overall quality of the test. Banking and reuse of questions also enables the standard of examination to be kept constant year after year. Lastly, question bank makes it possible to administer examinations frequently and on demand.

Certain precautions have to be maintained into organisation of a question bank. Questions must be kept secure and should not be evaluated at frequent intervals. It is quite possible that good question today would be considered obsolete or irrelevant after 5 or 10 years. It is thus essential that the questions in the question bank be reviewed and updated periodically. It is also frequently

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## FRONT

<u>Question Item</u>	<u>Bank</u>	<b>DEPARTMENT OF PHYSIOLOGY</b> A.I.I.M.S., New Deli - 110 029		
Ref. No. System	Topic	Time of Answering	Marks	Prepared by with date
9 Nerve-muscle	Compound action potential	1 min	1	RLB, 1978
<b>OBJECTIVE TESTED</b>				
<b>QUESTION ITEM</b> <b>All components of compound action potential can be best seen if</b> A. <i>the distance between the stimulating and recording electrode is large</i> B. <i>the stimulus applied is the threshold stimulus for A fibres</i> C. <i>a portion of the nerve between the stimulating and recording electrodes is cooled</i> D. <i>the nerve is immersed in a hypertonic saline solution.</i> <b>Key - A</b>				

## BACK

Sl. No.	Examination with Date	No. Examined	NO. RESPONDED						Diff. Index	Discr. Index	Remarks
			A	B	C	D	E	Blank			
1.	1st MBBS Oct. 14, 1982	38	31	3	1	0	--	3	81.6		Quite easy
			H 11	10	0	1	0	--	0	0.27	Good question
2											
3											
4											

Fig. 2. Question analysis card

observed that certain questions from the bank are repeatedly used and some may never be used. This defeats the very purpose of the question bank. It must be ensured that all questions are used periodically and over-worked questions are excluded from the bank.

To organise a question bank, separate cards need to be maintained for each question. A card should provide information on the following topics besides the question itself :

- Topic/syllabus/section
- Cognitive domain being tested
- Key to the question
- Examination with dates where used
- Item analysis after each use.

Question cards should be classified and stored in separate sections for each syllabus topic. Instead of cards, computers can also be used for organising the question bank. For a computer based question bank, however, safeguards need to be provided to ensure secrecy.

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# OBJECTIVE STRUCTURED PRACTICAL EXAMINATION : THE J.N.M.C. EXPERIENCE

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**SUMMARY :** To assess the competence of students at the end of practical training, various measuring instruments have been used in the past. Lack of objectivity and an element of chance are the most glaring deficiencies of the Traditional Practical Examination (TPE). Search for an alternative has engaged the minds of many educationalists. Objective Structured Practical Examination (OSPE) has been tried, with varying degree of success, since 1979. We have studied the feasibility of OSPE and attitude of the students towards the two types of examinations.

M.B.B.S. Phase - I students were examined by OSPE and TPE on two different occasions. The students scores in OSPE are fairly evenly distributed as compared with the distribution of scores, in TPE, which exhibited a central tendency. OSPE appears to be a better discriminator of students capabilities.

It was a pleasant surprise to see the students supporting OSPE strongly. OSPE reduces the element of chance during examinations and enables the examiner to assess the practical skills on a wider spectrum of activities.

OSPE emerges as a credible alternative to the game of Russian roulette that the TPE is turning out to be. However, one cannot ignore the changing attitude of the examiners. No system is good or bad, for any system is as good or as bad as the people who operate it.

Objective  
TPE

Practical skills  
OSPE

Examination  
Attitude of students

*"Examinations are formidable even to the best prepared, for the greatest fool may ask more than the wisest man can answer"*

- Charles Colton

The search for an ideal examination system which can assess the competence acquired by a student at the end of the practical training course, objectively and reliably, has proved elusive to medical educationists. The traditional practical examination (TPE) has been rightly criticised for its lack of objectivity. (Harden RM and Gleeson FA 1979). The student is supposed to perform but one from among a score of practical exercises. The particular practical which the examinee has to perform on the day of the examination is decided by a draw of lots, a system which apart from introducing the element of chance also provides scope for manipulation. More importantly the examiner hardly gets a chance to assess the skills acquired by the students, the examination invariably fizzling out into a theoretical duel. The situation deteriorates even further when the number of students appearing for the examination on a given day increases and the examination itself stretches beyond a week. The sheer monotony is bound to dampen the spirits of even the most diehard of the examiners.

In an era where so much is being said in favour of competence based medical education it is imperative that evaluation strategies too need a closer scrutiny. It is in this context that the Objective Structured Practical Examination (OSPE) has been advocated as a tool to assess the competence acquired by the student in various aspects of the practical exercise in a planned or structured manner with due attention being paid to the objectivity of the examination. (Harden RM and Cairncross RG 1980; Nayar U 1983, Nayar U, Malik SL and Bijlani RL 1986). We at the Dept. of Physiology, have made an attempt to study the feasibility of OSPE and the attitude of the students as well as members of the faculty towards the two types of examinations during the internal practical examinations.

## THE ORGANISATION :

The M.B.B.S. Phase I students admitted during November 1993 virtually having no exposure to any type of practical examination, were assessed by OSPE (April 1994) and the traditional practical examination (June 1994). The syllabi for the two examinations were identical.

### OSPE :

Detailed instructionss were given to the students regarding the pattern of examination. The whole class (195 students) was divided into batches of 20 students each. The students were assessed at a series of 20 stations with one or two aspects of competence being tested at each station. The students rotated round the stations spending a period of 5 minutes at each station. There were three types of stations :

- a) *Procedure stations*, where the students were required to demonstrate the practical technique to the observer.
- b) *Observation stations* where the students made observations from the experimental setup or a graph, on an answer sheet.
- c) *Question stations*, where the students interpreted the data provided / solved problems and the answers were written on a sheet of paper.

Generally the observation and question stations were related to the procedure demonstrated at the preceding station. The arrangement of the stations in a typical examination is shown in Table 1.

The examiners were provided with check-lists at procedure stations. The examiners observed the students as he/she performed the procedure and awarded marks for each step.

A sample check-list could be :

Question :

Percuss the lung fields, on the right side of the chest in the given subject.

### CHECK-LIST

	Step	Marks
1)	Gives instructions to the subject	0.5
2)	Employs correct technique of percussion	2.0
3)	Percusses perpendicular to the upper border of liver along mid-clavicular line	0.5
4)	Instructs the subject to place head for percussion in the axillary region.	0.5
5)	Percusses in the inter and infra scapular regions	0.5

**Table 1 : Arrangement of Stations in OSPE**

Station Number	Question	Method of scoring	Marks
1)	Prepare a peripheral blood smear	Observed and scored by Examiner A	5
2)	Identify the WBC focussed under the microscope	Answer on a sheet	4
3)	Composition and function of ingredients of Leishman's stain	Answer on a sheet	4
4)	REST	--	--
5)	REST	--	--
6)	Determine your vital capacity in the sitting position by using simple spirometer	Observed & scored by Examiner B	4
7)	Calculate the various lung volumes and capacities from the spirogram	Answer on a sheet	4
8)	Interpret the spirogram recorded from subjects with restrictive and obstructive airway disease	Answer on a sheet	
9)	REST	--	--
10)	REST	--	--
11)	Percuss the lung fields on the right side of the chest in the given subject	Observed and scored by Examiner C	4

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Station Number	Question	Method of scoring	Marks
12)	Calculate the respiratory dead space from the data provided	Answer on a sheet	4
13)	Questions pertaining to respiratory resuscitation	Answer on a sheet	4
14)	REST	--	--
15)	REST	--	--
16)	Collect and dilute the blood for	Observed and scored by Examiner D	5
17)	Count the number of RBC's in the square focussed under the microscope	Answer on a sheet	4
18)	Interpretation of Haemogram of an anemic patient	Answer on a sheet	4
19)	REST	--	--
20)	REST	--	--

**TPE :** The breakup of marks in this pattern of examination was as follows

Spotting	10 marks
Haematology	10 marks
Human Physiology	10 marks
Clinical Physiology	10 marks
Amphibian experiment	10 marks

Except for spotting, where all the students of a batch were exposed to the same questions, the students performed a single exercise in the other categories by picking up lots. A typical exercise in this pattern could be :

### **Determine your differential leucocyte count**

The students were assessed by the examiners at the end of the prescribed time.

The students were administered a questionnaire (Appendix) to obtain their impression about the two types of practical

examinations (Malik SL et al 1988). A likert 5-point rating scale (strongly agree, agree, undecided, disagree, strongly disagree) was used to assess the attitude of the students. The direction of attitude as well as the strength of the attitude were measured. The questionnaire comprised of 32 item statements pertaining to the reliability, content and the general organisation of OSPE. To ensure that the responses truly reflected the students feelings, they were instructed to write their roll numbers on the response sheet only after they had completed the task. The data obtained from OSPE and TPE were analysed. Item analysis of the Likert scale questionnaire was carried out. Views of the faculty members were also sought.

### HOW DID THE STUDENTS PERFORM ?

One hundred and eighty five students appeared for OSPE in April 1994 and 169 students took the traditional practical examination in June 1994.

The mean score of the students is significantly higher in the TPE than OSPE. (Table - 2) However, the range is much wider in case of OSPE. A significantly large number of students were able to secure 'average' (40% - 60%) scores in the TPE with only a minuscule of them failing to break the 40% barrier. The students scores in OSPE are fairly evenly distributed, while the distribution of scores in TPE is skewed positively and exhibits a central tendency. While the possibility of an improvement in the performance of the students on the second occasion cannot be discounted altogether, it does emerge that OSPE is a better discriminator of the students' capabilities. This is corroborated by the finding that there is no significant improvement in the number of students scoring more than 60% marks. This is hardly surprising in view of the tendency of the examiners to award 'passing' marks to the students, irrespective of the actual performance of the latter, during TPE.

**Table -2 : Performance of the students in OSPE and TPE :**

	OSPE (April 1994)	TPE (June 1994)
Observations	185	169
Score (out of 50)	25.47±6.88	27.95±4.95
Mean ± SD		
Range	6.5-38.5	11-37
Students securing :		
a) < 40%	43 (23.24%)	08 (4.73%)
b) 40% - 60%	92 (49.73%)	112 (66.27%)
c) > 60%	50 (27.03%)	49 (29.00 %)

(Z= 3.92, P<0.001, Chi. square = 25.189, DF = 2 , P < 0.001).

### **ATTITUDE OF THE STUDENTS TOWARDS OSPE AND TPE**

In a market economy, it is said the consumer is the king. There is no reason why this simple logic cannot be extended to the sphere of education as well. In this context it is pertinent to examine the attitude of the students towards the two types of assessment. One hundred and fifty one students who appeared for both the examinations responded to the questionnaire.

Students strongly supported the contention that OSPE reduces the element of luck or chance during examination and that it enables an examiner to assess details of the steps of a procedure on a wide range of skills (Table - 3) OSPE was rated as a fair examination as all the student are assessed by the same examiner. The system of marking by employing check lists was overwhelmingly favoured.

**Table - 3 : Reliability of OSPE : Students Attitude scores**

Q.No.	W.C. (151)	< 40% (32)	40%-60% (73)	>60% (46)
1.	3.84	3.63	3.88	4.07
6.	3.85	3.34	3.84	4.35
11.	3.83	3.34	3.85	4.31
16.	3.66	3.25	3.66	4.02
21.	3.90	3.41	3.85	4.22
26.	3.78	3.31	3.94	4.19

In our institution, where attendance to classes is compulsory, students have been found to comply with this regulation more in letter rather than the spirit behind the guideline. Hence it was refreshing to note that OSPE induces the students to pay more attention to practical skills and practise them thoroughly (Table-4). While the students liked the idea of having observation and question stations followed and related to procedure station, they felt that OSPE tests recall of knowledge, probably a reflection on the use of Multiple Choice Questions at question stations. Inclusion of frog experiments in OSPE was not favoured. (Table - 5).

**Table-4 : Effect of OSPE on learning Behaviour :  
Students attitude scores**

Q.No.	W.C. (151)	<40% (32)	40%-60% (73)	>60% (46)
2.	4.05	3.72	3.94	4.54
7.	3.50	3.41	3.71	4.00
12.	3.68	3.06	3.68	4.15
17.	4.08	3.69	4.19	4.35
22.	3.66	3.06	3.75	3.98

**Table - 5 : Content of OSPE : Students attitude scores**

Q.No.	W.C. (151)	<40% (32)	40%-60% (73)	>60% (46)
3.	3.06	3.34	2.90	3.15
8.	3.63	3.50	3.70	3.80
13.	3.79	3.81	3.83	3.96
18.	3.79	3.06	3.88	4.00
23.	3.37	3.44	3.51	3.16
27.	3.70	3.31	3.76	3.85

The students felt that the time allotted for procedure stations was not adequate, a sentiment echoed by some of the examiners as well (Table -6). Structural modifications are being contemplated to overcome this deficiency. The students did not concur with the view that OSPE is physically taxing and that the performance decreases towards the last few stations. However, students with lower scores in OSPE expressed that it was confusing to switch from one problem to another in a short period of time. The "REST" stations which were a part of the circuit employed by us did not prove to be a distraction. The students did not want the examiners to comment at procedure stations indicating that such remarks are more likely to affect their performance negatively.

**Table - 6 : General Administration of OSPE :  
Students attitude scores**

Q.No.	W.C. (151)	<40% (32)	40%-60% (73)	>60% (46)
4.	2.78	2.74	2.60	2.84
9.	3.30	3.53	3.38	3.04
14.	2.91	3.07	2.94	2.51
19.	2.76	2.97	2.82	2.57
24.	2.84	2.71	2.69	3.00
28.	2.40	2.45	2.47	2.43
30.	2.65	2.76	2.75	2.25
31.	3.16	2.97	3.49	3.65
32.	1.98	2.13	2.07	1.67

In general the students opined that OSPE is a more challenging form of examination and is distinct from TPE (Table - 7). The students' response was divided on whether OSPE should be the only mode of practical examination. Only the low performers in OSPE felt that it is more stressful than TPE and preferred the latter system of practical examination. The students were undecided on the issue of whether it is easier to pass in OSPE than in TPE.

**Table - 7 : TPE and OSPE : Students Attitude scores**

S.No. (151)	W.C. (32)	<40% (73)	40%-60% (46)	>60%
5.	3.88	3.71	3.97	4.04
10.	2.97	3.69	2.81	2.30
15.	3.18	3.17	3.03	3.48
20.	3.6	3.59	3.25	3.22
25.	3.00	2.50	2.97	3.19
29.	1.96	2.09	1.87	1.78

### **CONCLUSION :**

OSPE emerges as a credible alternative to the game of Russian roulette that the TPE is turning out to be. All the students are required to answer the same set of questions and are assessed by the same examiner in a methodical way. The subjective bias of the examiner and the element of chance are minimised considerably.

The TPE has an inherent deficiency of restricting the assessment of the student to a single practical exercise thereby precluding the possibility of passing the examination in the event of performing poorly in that given practical exercise. OSPE on the other hand overcomes this drawback by offering multiple exercises for the assessment of the students, providing for a more balanced and fair assessment of the competence of the student. Moreover by shifting the emphasis from testing mere factual

knowledge to assessment of a wider array of practical skills. It is more likely to encourage the student to pay greater attention to the acquisition of practical skills. To sum up, OSPE certainly scores over the TPE by reducing the element of luck, minimising examiner bias and by offering greater opportunity for the student to demonstrate his competence.

In view of its influence on learning behaviour of the student, OSPE is a distinctly better method of formative evaluation. A serious thought needs to be given to the question of whether it can completely replace the TPE.

We have adopted the model proposed by Dr. Usha Nayar and her colleagues at the Dept. of Physiology, All India Institute of Medical Sciences, New Delhi, with certain modifications to suit our own requirements. With some effort and planning, other disciplines too can devise OSPE in their respective subjects.

The very nature of OSPE makes it imperative that the educational objectives of practical training have to be clearly defined from the begining. What the student should learn ought to be precisely determined first and only then the standards can be set, as to the level of competence desired to be achieved by the student in that sphere of activity, at the time of assessment.

Finally, one cannot ignore the changing attitude of the examiners themselves. No system is good or bad, for any system is as good or as bad as the people who operate it. A lot of soul searching on the part of the medical fraternity is called for, if attempts at lifting medical education from the morass that it finds itself in, have to bear fruition!

### ACKNOWLEDGEMENTS:

The authors wish to place on record their grateful thanks to Dr. H.B. Rajashekhar, Principal, J.N. Medical College, Belgaum, Dr. B.S. Kodkany and C.S. Patil, Directors, Dept. of Medical Education for showing keen interest and their constant

encouragement in undertaking this project. Our sincere thanks are also due to Miss. Sunanda Halki and Mr. B.M. Bistannavar, for helping us with the statistical analysis and Mr. A.S. Wadimath for secretarial assistance.

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## Appendix

### FEEDBACK QUESTIONNAIRE

- 1) Check - Lists provide a fair and good system of marking.
- 2) OSPE encourages us to pay more attention to practical skills and practise them thoroughly.
- 3) Simulated graphs should not be used in OSPE.

- 4) There is ample time at question stations.
- 5) OSPE is more challenging form of examination.
- 6) OSPE decreases the element of luck or chance in practical examinations.
- 7) Stimulus for learning is greater from OSPE than from the TPE.
- 8) The observation station after every procedure station is a good idea.
- 9) It is confusing to switch from one problem to another within such a short period.
- 10) I prefer TPE to OSPE.
- 11) OSPE enables the examiners to assess many practical skills.
- 12) OSPE is a good form of examination as well as learning experience.
- 13) Frog experiments should not be included in OSPE.
- 14) OSPE is physically taxing.
- 15) OSPE should be the only mode of practical examination.
- 16) OSPE tests details of the steps of procedure.
- 17) OSPE encourages students to be more attentive in practical class.
- 18) OSPE tests recalls of knowledge.
- 19) The performance decreases towards the last few stations.
- 20) OSPE is more stressful than TPE.
- 21) OSPE is a fair examination as all the students are being assessed by the same examiner.

- 22) One cannot pass in OSPE without attending classes regularly.
- 23) Some stations test skills which are not taught.
- 24) OSPE is quite an easy type of examination.
- 25) It is easier to pass in OSPE than in TPE.
- 26) OSPE tests a wide range of skills.
- 27) Having question stations related to the procedure stations is a good idea.
- 28) Time is sufficient at procedure stations.
- 29) There is not much difference between OSPE and the TPE.
- 30) Instructions are not clear at procedure stations.
- 31) I do not want examiners to comment at procedure stations.
- 32) Rest stations are a distraction.

# OBJECTIVE STRUCTURED CLINICAL EXAMINATION

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Medicine began as an art and gradually evolved into science over the centuries. For diagnosing the disease correctly a physician has to take the relevant history and elicit the signs and symptoms by physical examination. A provisional diagnosis is made based on the history and examination. Physician is required to carry out the relevant investigations and administer the treatment. History taking, doing physical examinations and investigations requires special skill for which medical students are taught over 3 years. The traditional system of clinical examination has limited scope to assess the various skills that have been obtained by the student. Very often in this system attention is paid to the detection of abnormal findings while no attempt is made to watch the student taking a history from the patient. Several times the examination ends up with theoretical discussion. In a clinical examination there are three variables the student, the examiner and the patient. Variability due to the patient and the examiner can be removed. Unreliability in the clinical examination results from the fact that different students are examined on different patients. Added to this is the problem of choice of patients which depends on availability of patients in the hospital.

Objective structured clinical examination is an attempt to make the examination more valid and reliable. It is a method of assessing a student's clinical competence objectively. In this the areas tested are carefully planned by the examiners. the aim of the examination is to test the knowledge as well as the psychomotor skills. The whole system is divided into different components depending upon the departmental objectives. The different

components are as follows:

- 1) History taking
- 2) Clinical examination
- 3) Identification of problem
- 4) Formulation of investigations
- 5) Interpretation of results
- 6) Outlining the management
- 7) Demonstration of procedures
- 8) Communication skill
- 9) Health education and prophylaxis
- 10) Community care

Questions are formulated in such a way that each component is assessed at one or more stations. There are 20 stations and students are made to rotate round these stations. At each station the student is given a specific task based on one of the components. The student is allotted 4 minutes at each station for performing the task. At the end of the specified time the bell rings and the student moves to the next station. Stations can be of two types.

**I. Procedure stations :** At these stations the student has to perform a task. While the student is performing the task the examiner observes. Examiner has the check list with him based on which he grades the skills that are demonstrated.

**II. The question or interpretation stations:** Here the student either has to answer a specific question which may be based on the results of the previous station or has to interpret the data that is provided. The data is based on the specific component of patient problem. This station can be MCQ after physical examination station. The presence of examiner at this station is not necessary.

All the students rotate through all the stations. Since the time allotted to each station is 4 minutes the questions need to

be highly objective and cover a limited aspect of each component e.g Take a history of this patient who complains of pain in chest. The examiner is asked to note the performance of the student in three areas.

- a) His relationship with patient establishment of rapport with the patient, use of patient's name etc.
- b) His technique of history taking e.g. correct phrasing of questions, correct pace of questioning.
- c) Enquiry about the key points in the history.

Marks are allotted to the student based on the checklist. However if the examiner feels that some additional relevant points have been covered bonus marks may be awarded.

For stations meant for physical examination care should be taken to see that a limited area is covered so that the student will be able to carryout the examination in the time allotted.

The examiners have to decide in advance the contents of each station. They have also to agree upon the checklist. More straight forward cases may be for junior students and advanced complicated cases for senior students.

### **Advantages :**

- 1) OSCE is more valid as the examiner has the control over the contents.
- 2) More reliable - The variables of the examiner and the patient are to a large extent removed.
- 3) A large number of students can be examined at a time.
- 4) Since the instruction to the examiner is very clear and each examiner has a checklist, more junior examiners may be used.

### **Disadvantages :**

- 1) Students knowledge and skill are tested in compartments
- 2) Students ability to look at the patient as a whole is not tested.
- 3) Since more number of students examine the patient there are chances that the patient will become non-co-operative and refuse to answer. This problem can be overcome by having some simulated patients.
- 4) The examiners are required to pay close attention to students repeating the same task several times.
- 5) Time involved in setting up the examination is greater than for the traditional examination especially if OSCE is being conducted for the first time.

### **Uses of OSCE :**

- 1) To assess the degree of clinical competence both for undergraduate and postgraduate examinations for in-course as well as final assessment.
- 2) OSCE is especially useful to findout whether a student has reached a prescribed standard or not. The system indicates the area in which the student is deficient and in which he needs to acquire further skills. Thus it is a feedback both for the students as well as teachers.
- 3) OSCE may be used as the sole assessment of clinical competence or may be combined with long case or some other form of examination.

### **Organisation of an OSCE :**

Preparation for OSCE has to be started much before the expected date of examination. The organisation can be considered under four headings.

- 1) Advance planning
- 2) Organisation on the day before the examination
- 3) Organisation on the day of the examination
- 4) After the examination.

### **Advance Planning**

Planning for examination should start 2-3 months in advance

1. List of examiners has to be prepared.
2. Place for conducting the examination has to be finalised. Ward/seminar room suitable for arranging 20 stations may be selected.
3. Contents of the stations have to be decided keeping in mind the objectives of the course.
4. Design of stations - Each station should be designed in such away that the student is able to perform to given task in the stipulated time.
5. Selection of patients - There can be real patients for the examination. If the number of students is more, periodic rests should be given to the patients in order to avod them becoming non-co-operative. Sometimes 2-3 patients can be put at the same station and students alternate in examining them. Simulated patients may also be used.
6. Nursing staff, patients and thier relatives have to be informed.
7. Student should be briefed in advance regarding the type of examination
8. Weightage to each issue and pass percentage has to be decided.

9. Checklists have to be prepared
10. Direction of movement of students has to be decided.

### **Organisation on the day before the examination.**

1. Station to be arranged by evening.
2. All the instruments required for the examination to be checked and kept ready.
3. Arrangements to be made for the refreshments to be provided to the examiners, students, patients and other concerned staff.
4. Checklists, students instruction sheets, answer sheets should be kept ready.

### **On the Day of Examination**

1. Organiser of the examination should be in the hall one hour before the scheduled time.
2. Stations should be checked with respect to the position and numbering .
3. Patients and equipments are checked again
4. Students are briefed in the side room .
5. Examiners have to be stationed and they should not be allowed to change the stations till the examination is over.

### *After the Examination*

1. Feedback to be provided to the examiners as well as students.
2. Any deficiency in the organisation to be noted and rectified in the subsequent examinations.

No Single method fulfils the criteria of a good examination system. An ideal examination system will have to be a combination of different methods which complement each other. A traditional examination of "long case" allows holistic evaluation of the system, while OSCE can be used for other wide ranging objectives including problem solving exercises, case studies, investigating procedures, communication skill etc.,

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